Gas Journal

LIGHT - HEAT - POWER - BY-PRODUCTS

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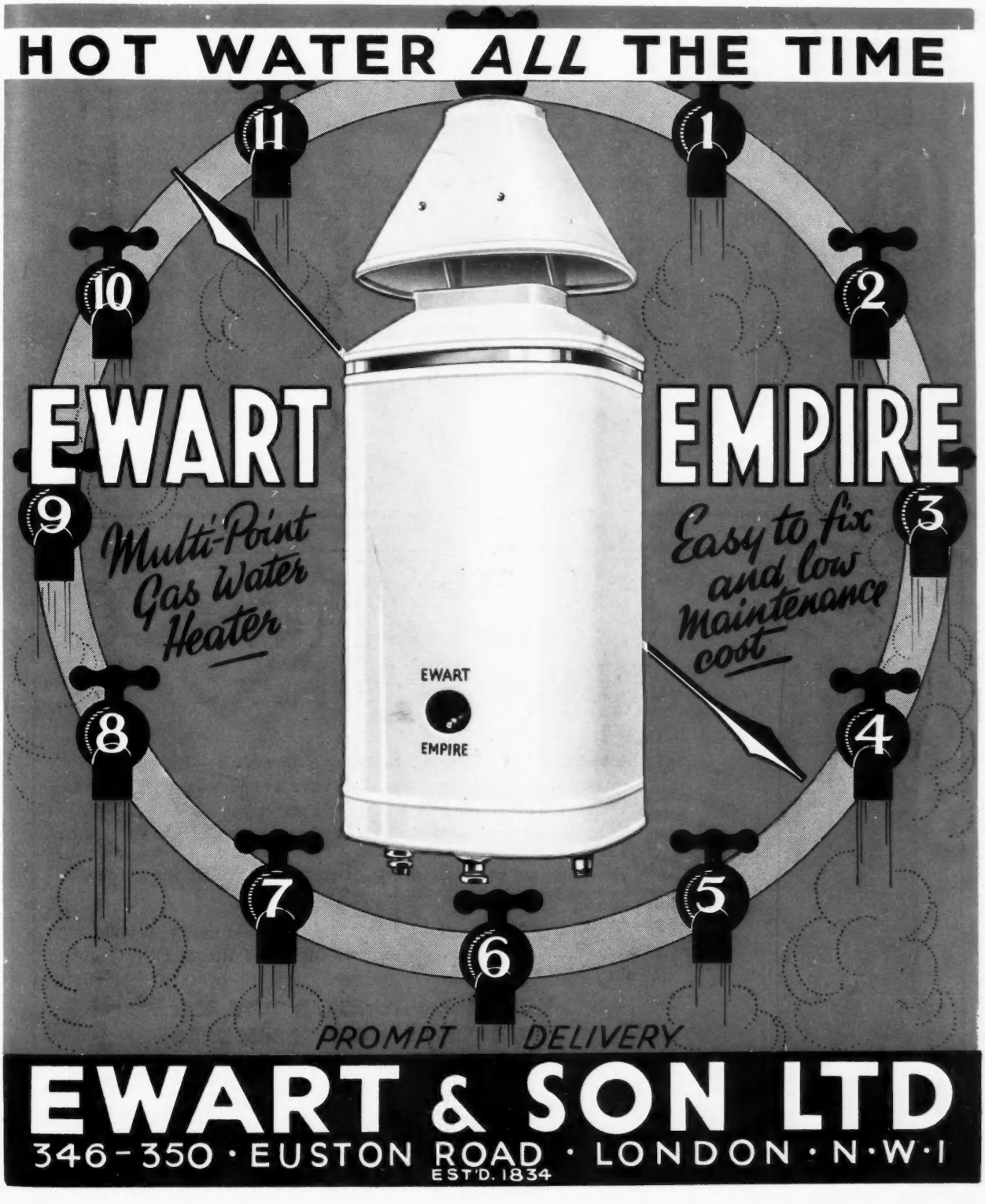

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Advertisement Index, see p. 37.

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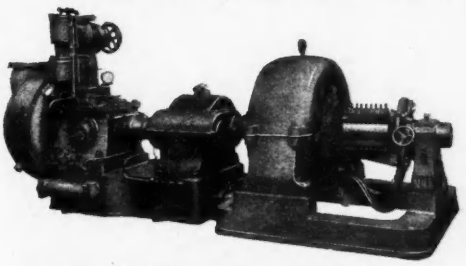

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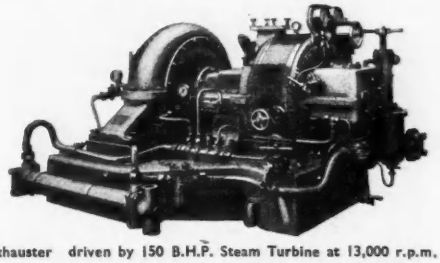

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P 7

GAS JOURNAL, OCT. 2, 1940

VOL. 232 92nd YEAR No. 4037

EDITORIAL NOTES

MOBILE GAS PRODUCER FUEL

A CONFERENCE was called last week by the Government Producer Gas Plant Licencees' Association to discuss various aspects of gas producers for use on road vehicles. This is a new body, and we understand that it is to be constituted very shortly on a permanent basis to include not only manufacturers of gas producer plants but also all interested in the subject, including those on the fuel side. The all-day meeting in question was held at Caxton Hall, Westminster, the principal problems under review being the qualities required of a fuel for the purpose, and design of the producer itself, with particular reference to the filtering systems employed. Among the speakers were members of the Gas Light and Coke Company—engaged on both the scientific and the operational sides—and of the Fuel Research Station.

It is common knowledge that much work of an investigational character has been carried out by both the Gas Light and Coke Company and the Fuel Research Board on the development of the mobile gas producer and the preparation of fuels possessing the needed properties. This work continues. At the Fuel Research Station a vast number of fuels have been prepared from coals throughout the British Isles. In general, it may be stated that low-temperature coke low in tar and ash has been found suitable, and the Fuel Research Station is now engaged in preparing a specification of a preliminary character in order to standardize these fuels or to keep them within such limits that an unsatisfactory fuel is not sent out. Certain anthracites have, of course, proved successful, but supplies are limited. We think they are about sufficient for 10,000 commercial vehicles, based on the average mileage of such vehicles—and this is not a very great deal considering the number of vehicles in use, or which could be in use, in this country. Now it was emphasized at the meeting that the production of suitable low-temperature cokes involves much time and money for building the necessary plants—to say nothing of the availability of the material required in their construction. What one could think of, however, said a member of the Fuel Research Station, was the Gas Industry. The object, he went on, should be to modify the normal gas-works process so that there could be prepared a fuel suitable for producers. "If that were done, then the fuel problem as regards producers was solved." His idea is the production of a fuel at a carbonizing temperature slightly lower than that of normal gas-works procedure. A number of fuels prepared in this way have, in fact, been tested at the Station. The difficulty is to produce a fuel under such conditions sufficiently low in tar content and sufficiently reactive. He explained, though, that at the present time there are some 10 gas-works producing in large-scale plants these medium-temperature fuels which are now being tested under various conditions, and "the indications are that the bulk of them will prove satisfactory," and, on the whole, the position is "extremely promising."

An experienced driver of producer gas vehicles—he is in the employ of the Gas Light and Coke Company—discussed the problem from the point of view of the drivers. His main contention was that the training of many of the drivers of these vehicles is inadequate. It cannot be regarded as reasonable for firms purchasing new producer gas vehicles to give their men perhaps half an hour on their working. This speaker in the discussion at the meeting maintains a fleet of 17 such vehicles. They are used for short-distance work, so that it may be assumed that the conditions are the worst possible. But all the vehicles are running well. It was emphasized, however, that their efficiency could not have been kept up had not the drivers received good training.

The several problems associated with the use of producer gas for motor transport are being investigated and elucidated, and the Gas Industry, it would appear to us, having been active in investigational work—a matter to which we have referred previously in these columns—will be no less active if called upon to pull its weight in possible future large-scale development, in particular in the manufacture of prepared fuel suitable for the purpose in hand.

INDUSTRIAL RESEARCH IN AUSTRALIA

FOR some time the National Gas Association of Australia has been developing the process for the control of the composition of atmospheres within furnaces, and the results of its investigations and researches have been set out in a recent issue of the Association's *Bulletin*. The work undertaken has obviously been very thorough and the Association has realized what a valuable potential load the process offers for gas undertakings. Improved and faster production methods, increased uniformity, less wastage, lower cost, reduction of one or more processes in production—these are among the reasons why this outstanding advance in furnace technology has won widespread adoption by manufacturers in the United Kingdom and in the United States of America.

The first systematic Australian investigations of furnace atmosphere control were commenced in the Melbourne laboratories of the Association towards the end of 1938. At that time, of course, a large amount of published information was available as a result of research and application of the new principles in Great Britain and America. The general principles were, indeed, well known, but little progress had been made towards their application in Australian industry. One barrier was the lack of practical experience in this branch of furnace work. As the *Bulletin* rightly points out, there is a good deal of difference between the possession of knowledge of the theoretical basis of atmosphere control and the practical application of that knowledge. To the industrial engineer, a manufacturing problem presents itself in a concrete form. Metal of certain composition and structure is required to be heated so as to produce certain effects. The problem is not solved until full details of treatment are known and exact

conditions and suitable equipment can be recommended. Even if a parallel case is cited in the technical literature, essential details may well be lacking; practical investigations are necessary to find a solution. It is good to learn that during the brief time in which Australian researches have been conducted industrial engineers have been able to gain valuable experience in the practical application of furnace atmosphere control; and in the light of this experience it has been possible to design equipment in Australia for the preparation and regulation of special atmospheres. On the theoretical side, the behaviour of certain metals and alloys under various conditions of treatment has been closely studied, and the knowledge thus acquired serves as the basis for the investigation of specific manufacturing problems.

The publication to which we refer contains much information of first-rate value, and the sponsors of the investigation are to be congratulated on the outcome of their work to date. The *Bulletin* tells how Australian manufacturers are already benefiting from the application of the principles of furnace atmosphere control, and what steps are being taken to ensure that, wherever applicable, this up-to-date feature of metal treatment may be made available to the rapidly expanding secondary industries in Australia. Some of the problems encountered and the way in which they have been solved are outlined to indicate the practical value of controlled atmospheres. The brazing of copper, brass, silver solder, &c.; furnace pickling; scale-free hardening of steels; and bright annealing are dealt with. The story is, indeed, another example that it is not by accident that industrialists in Great Britain and in the U.S.A. and Australia have become aware to their advantage of the merits of town gas as an industrial fuel. The application of gas to all manner of furnace work has been made possible only by the activities of the research and industrial departments of gas undertakings and of co-operative organizations in helping individual firms. To-day the atmosphere controlled process for heat treatment of steel, the result of scientific theory allied to works practice, is acknowledged to be the best process in existence for the hardening of high-speed steel.

Formerly, hardening of high-speed steels was a compromise between possible quality and the limitations of practice. The temperature is high. Actually it borders on the fusion point of scale, and any formation of scale and its subsequent fusion is bound to damage seriously the cutting edges of a tool. The compositions of high-speed steels are such that long times of soaking are desirable to give the type of internal structure which can stand up to long usage at high cutting rates. The size of the grain of the internal structure is, however, an important metallurgical factor. This is usually better the smaller the grain size, but grain size increases with increased soaking times under normal conditions. The damaged surface of the metal due to scaling and decarburization has to be removed by expensive grinding operations, and possible maximum quality of the tools is impaired. All difficulties, through research of the type we have mentioned, have been successfully overcome in designs of gas-heated furnace incorporating atmosphere control. In our own country furnaces are available which are controlled in every possible way—atmosphere control, automatic temperature control, and automatic control of atmospheres with varying furnace processes. The operator has actually only one adjustment to make, and that only when he begins to use a new type of steel. Then he has to set his ratio of purging gases to give undamaged steel, a matter requiring the heating of only a few test pieces. After that the furnace is completely under automatic control, of both atmosphere and temperature. Use of such furnaces for tool treatment has resulted not only in greatly reduced labour charges to remove damaged surfaces, and elimination of ruined tools, but in nearly every case the cutting quality of the tools has been considerably increased.

That co-operation between gas undertaking and gas undertaking and between gas undertaking and the manufacturer has been established on such good grounds in Australia—as indicated in the National Gas Association *Bulletin*—is a source of gratification, more especially in the circumstances which confront us.

Personal

Mr. JOHN BRABBS, who is retiring, after twenty years' service, from the position of Engineer, Manager, and Secretary of the North Cheshire and District Gas Company, was formerly with the Selby Gas Department. In 1914 he was appointed Engineer and Manager at Bollington, near Macclesfield, becoming Manager of the Hyde Gas Company in March, 1920. When the latter undertaking was incorporated in the North Cheshire and District Gas Company several years ago, Mr. Brabbs was appointed Secretary. Mr. Brabbs was also Engineer, Manager, and Secretary of the Broadbottom Gas Company. His successor, as announced last week, is Mr. N. B. Thompson, of Ormskirk.

* * *

Mr. P. F. WHITE has retired on superannuation from the combined position of Gas and Electrical Engineer to the Bangor (North Wales) Corporation. The Council has now separated the two offices and has appointed Mr. A. H. OWEN, of Bangor, as Gas Engineer and Manager.

* * *

Alderman W. BURROWS, J.P., has been elected chairman of the Warrington Corporation Gas Committee in succession to the late Alderman Sir James Crooks, J.P. Councillor R. RENNIE has been elected Deputy-Chairman. Alderman Burrows has been Deputy-Chairman for approximately five years.

* * *

Mr. R. BOWDEN, for the past 25 years Works Superintendent at Lincoln, has had to tender his resignation owing to ill-health.

Obituary

The death has occurred of Mr. FAIRFOUL THOMSON, of Alder & Mackay, Ltd. Mr. Thomson joined the firm in 1887 and was for many years senior representative in London and the south; his whimsical and cheerful presence was welcomed at meetings in London and in South Wales, where he was a well-known figure. After 46 years' service, he retired from active work in 1933, but was in close touch with business affairs until his death, following a brief illness, on Sept. 14. Sympathy will be extended to his widow and his three sons, two of whom are engaged in the Gas Industry.

Forthcoming Engagements

Oct.

7.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 2.15 p.m.; General Purposes Committee, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.

8.—I.G.E.—Council, 10 a.m.

8.—Illuminating Engineering Society.—Meeting at Royal Institution, 2.30 p.m. Presidential Address of Prof. J. T. MacGregor-Morris.

9.—I.G.E.—Board of Examiners, 2 p.m.

15.—I.G.E.—Gas Education Executive Committee, 2 p.m.

18.—Manchester District Association.—Meeting. Paper by R. L. Greaves.

☞ *There will be no meeting of the Central Executive Board of the National Gas Council during October.*

"Gas Journal" Directory

In order that readers may be able to keep the particulars contained in the "JOURNAL" Directory up to date, we summarize changes of which we have been advised during the past month:

Page 6. BANGOR. A. H. Owen appointed E. & M. vice P. F. White, retired.
„ 6. BENTHAM. J. Mason appointed M. vice A. W. Cooper, resigned.
„ 10. BRIDGNORTH. R. J. Bradshaw appointed E. & M. vice C. B. Wallis, retired.
„ 12. BROADBOTTOM. N. B. Thompson appointed E., M. & S., vice J. Brabbs, retired.
„ 40. LITTLEBOROUGH. D. J. Colvin, E. M. & S., resigned.
„ 48. MORPETH. Merged with Newcastle-upon-Tyne and Gateshead Company. R. Lockey, E., M. & S., retired.
„ 50. NORTH CHESHIRE. N. B. Thompson appointed E., M. & S.
„ 52. ORMSKIRK D. J. Colvin appointed E. & M. vice N. B. Thompson, resigned.
„ 76. WHITCHURCH (Hants.). A. W. Cooper appt. M.
„ 88. LANARK. T. Royden, E. & G.M., retired.
„ 92. PERTH. A. C. Rea, E. & M., resigned.

The Products Sales Office of the South Metropolitan Gas Company has been transferred to Coventry Hall, Streatham, S.W.16 (phone : Streatham 7771 ; extn. 8).

Notice is Given by the Exeter Gaslight and Coke Company that as from Jan. 1, 1941, they will supply gas of a calorific value of 460 B.Th.U. per cu.ft. in place of 475 B.Th.U. as supplied at present.

The Output of Gas at Leicester during August showed an appreciable increase over the corresponding month last year, the increase being the first since the war started. The output was 5.71% above that of August, 1939, in spite of the warmness of last month.

The Latest Activity of the Burnley Branch of the Women's Gas Council was a bridge drive in the Gas Showrooms attended by 60 members. Proceeds were given to local war charities. Mrs. A. F. Ames, President of the Branch, was responsible for the organization of the function.

The Following recently issued War Emergency British Standard Specification can be obtained on application to the Secretary, The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W.1, price 2s. each : No. 919-1940. War Emergency British Standard Specification for Screw Thread Gauge Tolerances.

Skegness Gas Committee at their September meeting again considered the question of closing the gas showrooms for the duration or allowing them to remain open. Eventually, by a majority, it was decided to recommend that the showrooms remain open as at present. It was also recommended that membership of the National Gas Council should be continued.

In Our Notice last week (p. 542) relating to a new patent for coke discharge in intermittent verticals we omitted to mention the name if Mr. Ernest West as one of the joint inventors.. It is, of course, well known that Mr. Ernest West takes a very keen and practical interest in the perfection of the details of the carbonizing system for which his Company are so widely and justly renowned.

The National Food Campaign is being well supported by the Leamington Priors Gas Company. In a recent series of daily lectures and demonstrations extending over a week, the Company co-operated fully—Dr. Harold Mason, J.P., Chairman of the Company, presiding at one of the sessions, while Miss Zita Fitz-Gerald, the Company's Demonstrator, lectured at three out of the five sessions. On the last day, the speaker was Mrs. Eileen Murphy, of the B.C.G.A.

A Tragedy overtook some members of the main-laying staff of a South-East Coast Gas Company recently. On the night of Sept. 11, William Hayward, Arthur Allison, and Alfred Brazier were instructed to proceed to a site where there was a large crater and gas was escaping freely from a trunk main. Shells continued to arrive all the evening, and they had to take cover from time to time, but towards midnight they were able to proceed with their work. Unfortunately, a violent explosion occurred through an unsuspected delayed action bomb, and Hayward lost his life.

The Opening Meeting of the Illuminating Engineering Society will be held on Tuesday, Oct. 8, in the Lecture Theatre of the Royal Institution, 21, Albemarle Street, W.1. The formal business of the meeting, together with the induction of the new President, commences at 2.30 p.m., following which Professor J. T. MacGregor-Morris will deliver his Presidential Address, entitled "The Arc as a Standard of Light," illustrated by experiments and demonstrations. Members of The Institution of Gas Engineers will be welcomed at this meeting, tickets of admittance to which may be obtained on application to the Secretary of the Institution, 1, Grosvenor Place, S.W.1.

New Gas Showrooms at Leven

The new offices and showrooms of the Buckhaven and Leven Gas Commissioners at North Street, Leven, were officially opened on Sept. 26. The construction and equipment of the new premises is the latest phase in the development of the Gas Undertaking, and adds yet another to the many improvements and extensions carried out since the undertaking was jointly acquired by the burghs of Buckhaven and Methil, and Leven. The opening ceremony, performed by the Chairman of the Gas Commissioners, was arranged on a modified scale from that originally intended owing to prevailing conditions.

In formally declaring the new offices and showrooms open, the Chairman referred to some of the principal improvements carried out in recent years by the Gas Commissioners, and he paid tribute to the ability of the Engineer and Manager, Mr. H. A. Aitken, whose guidance had played a very important part in the successful development of the Undertaking. On behalf of the contractors and himself, Mr. L. A. Rolland, the Architect, presented the Chairman with a gold watch, suitably inscribed, as a memento of the occasion.

In addition to a spacious and beautifully fitted showroom, where there is a large and varied display of the most modern gas appliances, the new premises include a boardroom and a suite of offices.

George Wilson Gas Meters

New Field of National Effort

The Fourth Annual General Meeting of George Wilson Gas Meters, Ltd., was held on Wednesday, Sept. 18, at Coventry.

Mr. J. H. WILSON (Chairman and Managing Director) said that the trading profit for the nine months ended March 31 amounted to £10,284, after charging the net cost of air raid precautions.

The burden of taxation had borne exceptionally heavily on the Company, owing to the unfortunate effect of the law relating to the taxation of new businesses where profits in the early years happened to be on a falling scale. In consequence, the total of the Company's assessable profits for income tax purposes since the date of incorporation had exceeded the total of actual profits earned in the same period. It was expected that the change of accounting date from June 30 to March 31 would result in the establishment of a more equitable basis of assessment.

After providing for the investment reserve of £1,500, taxation, and the dividend on the preference shares, the remaining profit amounted to £1,030, which was insufficient to justify the recommendation of any dividend on the Ordinary shares. The Directors recommend that £10,000 of the available balance be transferred to general reserve and £3,597 be carried forward.

During the period the Company had taken its place in an entirely new field of production connected with the national war effort. This change of activities had necessitated considerable expenditure on additional fixed assets, tools, and patterns, while the stock-in-trade and work-in-progress also showed a marked increase in value. It was clear, therefore, that additional working capital was required.

The Directors considered that such additional capital should be provided out of profits rather than by borrowing, in order to minimize the danger of over-capitalization during an emergency period.

The re-organization necessitated by the new activities was proceeding steadily, and the Company was thus making its contribution to the requirements of the nation in its present emergency.

The report was adopted.

Institute of Fuel

A Meeting of the Institute of Fuel will be held on Oct. 8 at 2.15 p.m. in the Connaught Rooms, Great Queen Street, W.C.2, when a Paper will be presented by Mr. W. L. Boon, of the London and Counties Coke Association, entitled "Some Thoughts on Coke," which will be followed by a discussion. Advance copies of the Paper can be obtained from the Secretary of the Institute of Fuel, 30, Bramham Gardens, London, S.W.5.

This meeting will be preceded at 12.40 for 1.10 p.m. by an informal luncheon in the same room, to which members can bring guests. The charge for lunch will be 5s. per head, to be paid at the table. No tickets will be issued, but members are requested to advise the Secretary of their intention to be present so that adequate accommodation can be provided.

At 2.15 p.m. on Oct. 17, again in the Connaught Rooms, W.C.2, a meeting will be held, when Mr. W. M. Selvey, M.Inst.C.E., M.I.Mech.E., M.I.E.E. (who has been Acting President during Lieut.-Colonel J. H. M. Greenly's absence abroad), will present an Address. It is hoped that the President will be in the Chair and announce the name of the Melchett Medallist for the current year and present the Student's Medal for 1940.

This meeting will also be preceded at 12.40 for 1.10 p.m. by an informal luncheon in the same place, to which members may bring their guests. Ladies will be welcome if they care to attend this informal luncheon. The charge for lunch will be 6s. 6d. per head (including gratuities), to be paid at the table. No tickets will be issued, but members are requested to advise the Secretary of their intention to be present, and the names of their guests, so that adequate accommodation can be provided.

Incidentally, there is an approved air-raid shelter at the Connaught Rooms for 2,500 people.

We may add that members of other Institutions will be welcome at these meetings.

Catering for Civil Servants

Gas Apparatus at Communal Feeding Centre

"Somewhere in the North-west" 1,300 civil servants are daily enjoying a three-course hot luncheon at a cost of 1s. 2d. each, in the cooking and preparation of which gas is playing an important part. This latest example of communal feeding was put into effect last week, and before long it may be necessary to provide 3,000 lunches each day.

Formerly at the Hotel Majestic, Lytham St. Annes, the chef is Mr. H. Crewe, who is once more cooking for civil servants, for he used to be in the kitchens at the Ministry of Health at Kew.

In this latest communal feeding centre, food is kept warm and served from a 30-ft. gas heated hotplate. There are also 25-gallon gas boilers, 50-gallon vegetable boilers and stock pots, and a large fish-fryer. There is an up-to-date bakers' oven, in which anything can be cooked, while the cafeteria serves between 450 and 500 teas daily.

The luncheon room seats 284 at a time, and arrangements have been made for three or four sittings. A staff of 36 is responsible for the work in connexion with the scheme, but this number will probably be increased in the near future.

Gas Solves the Problem of

INDUSTRIAL SPACE HEATING

WITH winter on the way and industry throughout the land working full steam ahead, there is going to be a greater demand for efficient and trouble-free factory heating. Old installations will have to be overhauled or replaced to meet more stringent requirements; new installations will have to be provided to serve factory extensions and new buildings generally.

In recent numbers of the "JOURNAL" we have discussed alternative methods of gas heating for industrial premises—central heating by means of gas boilers, more particularly applicable to new buildings, and overhead radiant heaters, which can readily be installed in existing premises without the need for structural alterations. There are still further methods of gas heating, including the overhead radiant combustor and the gas-fired unit heater; and in the present article we propose to deal briefly with the former of these two further systems—namely, the overhead radiant combustor. Each method of heating has its own particular advantages, and it is for the local gas undertaking's heating expert, in consultation with architect or heating engineer, to decide which system is the most appropriate to the circumstances.

Circular Type Combustors in a Factory

The problem of efficiently heating high works, engineering shops, &c., has always been a difficult one. Some seven years ago, however, the problem was taken up by a number of engineers who had no previous knowledge of what is known in this country as "central heating," but who had an intimate knowledge of domestic heating by radiant fires and industrial heating as applied to furnaces and culinary apparatus. The method was known as surface combustion—or burning gas without flame—and its first application to space heating was tested at Cheltenham, where it proved a success. Since then the system has been installed in some 500 works and factories.

Basically, the radiant surface combustion system consists of a panel suspended 10 or 11 ft. from the floor. This panel, which has a surface area of about 60 sq.in., is heated to 2,000° F. The incandescent panel is fitted with an extension panel of some 200 sq.in. through which the spent products of combustion pass, giving a face temperature of 400° F. The system is claimed by the makers (Radiant Heating, Ltd., and Arthur Docking & Co., of Barnsbury Park, N.1) to have an efficiency of 70-75% in the form of direct heat output, while the balance of the spent products assists indirectly by heating the upper air and preventing down-draughts. As is well-known, the form of heat emitted by this type of appliance does not heat the air through which it passes, the latter being warmed only by convection from the objects upon which the heat rays directly fall.

Advantages Claimed

Among the advantages claimed for this system of heating the following may be cited:

1. The air temperature not being raised to any extent prevents stuffy atmosphere.
2. A feeling of warmth is apparent immediately the panels are switched on. A works can be brought to a reasonable degree of comfort on a cold day within twenty to thirty minutes of lighting up.
3. There is no waste of useful B.Th.U. due to air absorption of the heat emitted.
4. The physcological effect of *seeing* the heat, as well as feeling it, is an important factor. In some large workshops as many as a hundred incandescent heating surfaces can be seen at one time. The effect of entering a workshop thus heated from a cold, murky outside atmosphere is like walking from fog into sunshine.
5. The system calls for very little maintenance, and, of course, there is no fuel storage, cleaning of fires, or disposal of ashes.
6. This method of heating is readily adapted to thermostatic control. This is usually affected by fitting a contactor switch on the motor-driven compressor so that when the temperature rises the thermostat cuts out the contactor switch, and *vice versa*. If a temperature of, say, 60° F. is desired, the thermostat will take care of it to within plus or minus 1½° to 2° F. Clock control can be fitted if required.
6. The flexibility of the system enables individual heaters to be used in any part of the workshop, resulting in a considerable saving of fuel, as it may often happen that only one or two heaters are required in one corner of the shop where overtime is being worked.

Economics of the System

Coming to the economics of the system, the makers observe that with gas at 5d. or 6d. per therm it compares favourably with any other heating method. But in these days it is worth while to consider the more vital aspect—when all our energies must be devoted to the war effort. Take, for example, an engineering shop measuring, say, 200 ft. square by 50 ft. high—or 2,000,000 cu.ft. The makers estimate the amount of heat required by the floor area only, ignoring height, would be 4,000,000 B.Th.U. per hour.

The system is, of course, equally suitable for warehouses, churches, restaurants, public buildings, stores, offices, &c., having as one of its obvious advantages ease of installation. If high-pressure gas is available, the combustors can be operated direct from the town mains with air at natural pressure. With low-pressure gas a small air compressor is necessary.

The following tests give an indication of the working efficiency of this method of heating:

In a factory building engaged in the production of stampings ten C.72 radiant heaters are installed. The building is 120 ft. long, 35 ft. wide, about 18 ft. to the eaves, and about 25 ft. to apex. Test figures taken gave the following results:

Date.	Temperature, ° F.		Period of Test.
	Outside.	Inside.	
Nov. 26, 1936	—	64–65	24 hours.
Nov. 27, 1936	38/41	,,	25 hours.
Nov. 30, 1936	33/50	,,	36 hours.

The average gas consumption per hour was 440 cu.ft.; and with a gas price of 6.2d. per therm, the cost of heating per hour worked out at about 1s.

The inside temperature, it will be observed, was much higher than necessary, and had the firm in question been content with the usual 50°-55° F., it is estimated that the running costs would have worked out, with gas at the price mentioned, at about 1d. per hour per burner—in other words, 10d. an hour.

Rectangular Type Combustors in a Large Printing Works

Below are details of monthly gas consumptions of system fitted in the erection shop of a firm at Bristol.

Gas service 3 in. dia. Meter 3,000 cu.ft. high capacity. No. of C.72 (9⅜ in. dia.) radiant heaters, 40. Maximum gas consumption per hour, 2,800 cu.ft. (13.44 therms).

Particulars of Building.—265,920 cu.ft. air space; 17,780 sq.ft. floor area; 5,870 sq.ft. glass area (north lights); 8,728 sq.ft. 9 in. brick wall area; 9,260 sq.ft. roof asbestos, corrugated, with inner lining, tongued grooved boards; 3 in. air space; three outer walls.

One side of the shop open to another heated by overhead steam pipes. (Shop size of opening 100 ft. by 10 ft. high.)

All heaters fitted 12 ft. from floor.

1937–38. Month.	Gas Consumption. Cu. Ft.	Therms.	Average Temps. ° F. Outside.	Inside.
November	94,900	455.52	—	—
December	196,800	944.64	44	60–61
January	286,500	1,375.20	42.4	60–61
February	257,600	1,236.48	45	60–61
March	231,000	1,108.80	46	60–61
April	114,000	547.20	49.45	60–61
TOTALS	1.180,800	5,667.84		

Total number weeks worked, 30, taking 10 hour per day (7 a.m. to 5 p.m.) in which heaters were on, and including overtime worked extra to the 10 hour; gas consumption per week, 37,026 cu.ft. (177,724 therms); price of gas, 5d. per therm.

Heating engineers estimated the cost for solid fuel central heating boiler, with mechanical stoker, to heat the above works at £4 to £5 per week. The actual cost of gas over six months worked out at £3 14s. 6d.

In a canteen 45 ft. by 45 ft. by 9 ft. 6 in. to eaves and 14 ft. 6 in. to apex, with usual north light roofing (slate roof), three walls are exposed to atmosphere. The floor area is 2,025 sq.ft. (19,406 cu.ft.). The period of test was from 9 a.m. on Jan. 24 to 7 p.m. on Jan. 28. The total gas consumption was 3,700 cu.ft.

The average period per day the canteen was heated was 9.45 a.m. to 6.30 p.m., and the total hours the heating was in operation was 41¼. The total hours the heaters were actually burning was 12¾. The average hourly gas consumption during the 12¾ hours was 289 cu.ft., and the average gas consumption during the total heating period of 41¼ hours was 90 cu.ft. per hour.

During this test the lowest outside temperature was 36° F., and the highest outside temperature, 46° F. The air temperature maintained inside was 55-59° F.; but as radiant heat was the source of heating, the effective temperature was equivalent to an air temperature 61-65° F.

ASSESSMENT OF COKING PROPERTIES OF COALS

From the *Journal* of the Institute of Fuel

By

AKIRA SHIMOMURA, F.Inst.F.

PROXIMATE and ultimate analyses of coals, although valuable in many respects, are of little value for determining the coking properties of a coal. A bulk test on a coal is costly and will be wasteful unless a full preliminary knowledge of the coal has previously been acquired.

In order to study the phenomena of coking, the investigation of the behaviour of a coal on heating is the most important and the most direct method. However, an investigation in this direction is always confronted with the difficulty of drawing an accurate parallel between the results of works practice and those of the laboratory experiments on account of inevitable differences between the working conditions. Even the results obtained on a semi-industrial scale, as, for example, the experimental coke oven at Sheffield University,[1] are often not exactly comparable with works practice. Under the circumstances, the only practical way left is for the investigator to attack the problem from as many different directions as possible, and to compare the results of these various experiments among themselves, at the same time taking into consideration the works results obtained independently. By examining many samples—the greater the number of samples the better—it is possible to obtain a certain correlating factor between industrial practice and laboratory experiments, and thus it becomes feasible to forecast industrial results from laboratory experiments alone.

In laboratory experiments there are diverse methods of carbonization, as, for instance, heating under such conditions that free swelling of a coal is allowed, or in such a way that swelling is totally or partially suppressed; the sample may be in lump, powdered, or briquette form; the heating may be slow or rapid, and so forth. In modern coke oven practice, on the contrary, the method of carbonization is more or less standardized, although there are modifications according to the localities and the nature of the coal employed.

In this Paper the results of my investigation on the behaviour of coals on heating, with special reference to certain British coal samples, will be described. In addition to some preliminary examination of coals as regards their softening and caking properties, numerous samples were subjected to examination—first, to determine their contraction and expansion on heating; secondly, to determine the pressure exerted on coking; and, thirdly, to determine the rate of evolution of volatile matter. While the methods by which these three phenomena are investigated are quite different, the phenomena themselves are closely inter-related, and the behaviour of a coal on heating can never be fully explained unless it be examined from these three angles.

TABLE I.

PROXIMATE ANALYSES OF BRITISH COALS.

Coal.	Volatile Matter.	Ash.	Fixed Carbon.
	(%, on dry basis.)		
A. Tredegar (S. Wales), washed duff	21.7	7.1	71.2
B. Powell Duffryn (S. Wales), washed duff ...	20.5	5.3	74.2
C. Bedwas (S. Wales)— Rock Vein, 59 per cent. ... ... Black Vein, 9 per cent. ... ... Lower Black Vein, 32 per cent.	27.3	4.6	68.1
E. Grassmoor, Waterloo (Derbys.), unwashed slack	37.9	7.4	54.7
F. Grassmoor, Tupton (Derbys.), unwashed slack	34.5	5.2	60.3
G. Grassmoor, Deep Hard (Derbys.), unwashed slack	33.3	12.1	54.6
H. Grassmoor, Black Shale (Derbys.), unwashed slack	36.0	6.7	57.3
I. Manvers Main, Barnsley (Yorks), washed unscreened slack	36.8	2.2	61.0
J. Manvers Main, Parkgate (Yorks), washed, unscreened slack	34.8	3.4	62.8
K. Brandon, Busty (Durham), unwashed run-of-mine	29.0	4.1	66.9
L. Brancepeth, Seggar (Durham), unwashed run-of-mine	31.4	1.5	67.1
M. Brancepeth, three quarters (Durham), unwashed run-of-mine	30.2	4.7	65.1
N. Brancepeth, Ballarat (Durham), unwashed run-of-mine	28.2	2.3	69.5
O. Brancepeth, Brockwell (Durham), unwashed run-of-mine	28.9	1.1	70.0
P. Deep Pit, Shelton (Staffs), unwashed slack of mixed seams of Holly Lane, Cockshead, Ten Feet, and Two Yard	34.9	4.2	60.9
1. Plymouth (Notts), slack	34.9	16.3	48.8
2. Laughton (Notts), slack	35.6	7.8	56.6
3. Soft Seam, No. 6 Pit (Notts)	36.7	12.1	51.2
4. Lowmain (Notts), slack...	34.7	10.2	55.1
5. Silkstone (Notts), slack	33.6	11.2	55.2

* These samples were obtained by the courtesy of Messrs. Chemicals and Coke Ovens, Ltd.; and the experimental work thereon was conducted by my brother, Koji Shimomura, to whom my thanks are due.

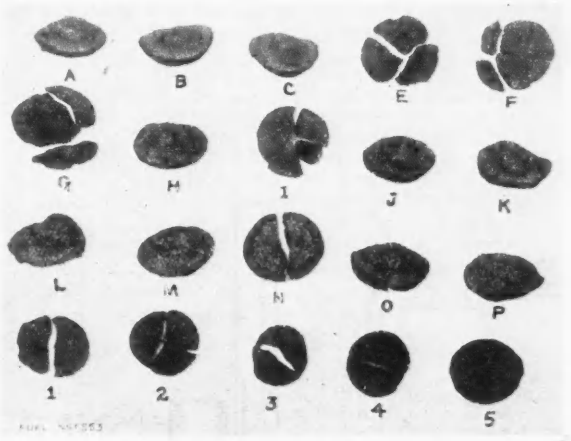


Fig. 1.—Crucible cokes of British coals

Samples of Coals

The samples examined, more than 150 in number, comprised coals of Japanese, Chinese, Indo-Chinese, and European origin, and laboratory-prepared as well as commercial coal blends. In addition, 20 samples of British coals and blends* for coke manufacture were also examined. Their analyses are given in Table I, and a photograph of their crucible cokes is reproduced in Fig. 1.

Extraction of Coals with Organic Solvents

With a view to studying the fundamental structure of coals, the extraction method, using pyridine and chloroform, was first developed by the late Prof. Wheeler and his co-workers[2] and their method has since been considerably elaborated. Later, Franz Fischer and his co-workers[3] carried out extraction of coals with benzene under pressure. Although there has been much discussion and controversy between these two schools, it is now generally accepted that the γ-compound of Wheeler and the oil-bitumen of Fischer are responsible for the caking or agglutinating property of coals.

Parr and Hadley,[4] on the other hand, emphasized the convenience of phenol as a coal solvent. In my experiments I merely employed coal extraction as an analytical method, and for this purpose I found that phenol is the most convenient to use, as the amount of extractable matter is comparatively large and the experimental manipulation is simpler than with other solvents.

Whether the extraction of coal with phenol is a pure solvent action is open to discussion. Probably it is not. Moreover, the nature of the extractable matter is by no means uniform. However, it is almost certain that the caking and swelling constituents are wholly or mostly contained in the phenol-extract, and the amount of the extract has a close relationship to the degree of caking and swelling properties of a coal. The percentage of the phenol-extract, therefore, and especially its ratio to the volatile matter content of the coal, is a fair guide as to its caking and swelling properties. On the other hand, the nature of the residue insoluble in the solvent should not be overlooked when the coking properties are under discussion. As suggested by Barash[5] and Mott,[6] the varying porosity, or absorption capacity of the residue, or its degree of "wettability" by the "binder" (the extractable part), seems to perform an important function in coke formation.

The amount of the extract (by 24-hour continuous extraction with boiling phenol in an atmosphere of CO_2), from Japanese bituminous coals ranged from 23.1% to 50.4% (on dry, ash-free basis); while that of European coking coals was generally from 15% to 35%.

Colour of Powdered Coal in Relation to its Caking Property

All coal analysts must have noticed that the colour of a sample bottle containing pulverized coal, or, to be more accurate, the colour of the fine coal powder that adheres to the inner surface of the bottle, is often different from one sample to another. Some are very black, while others are brownish or even yellowish, and there are all shades between these extremes. This delicate difference of shades may also be detected by rubbing the finely powdered coal—the finer the better—on a piece of white paper, or even by making a streak with a piece of coal on a suitable rough surface as is commonly done in mineralogy. In these tests it is advisable to compare the colour at the same intensity of mark

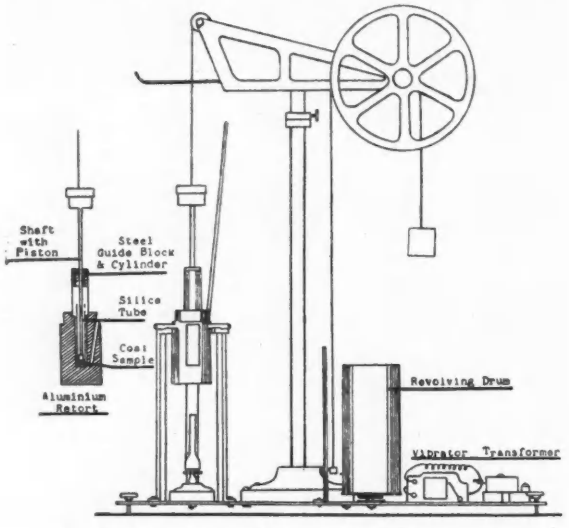


Fig. 2—Constructional design of the K-B-S apparatus

or streak, as the browner powders usually adhere more strongly than the blackish ones. In comparing these colours, one notices that the browner the powder the more strongly caking and swelling is the coal in a general way. It was also found, in general, that the browner the coal the higher the content of phenol-extract or hydrogen. This is evident from the fact that the phenol-extract is quite brownish, while the residue is always black. On the other hand, the γ-compound is also distinctly brown when powdered, the α-compound is black, while the colour of the β-compound lies between the two. Partially hydrogenated coals are browner than the original coals.

The foregoing colorimetric test when applied to determine the caking power of coals is, of course, very crude, and can hardly be called scientific, but it is interesting inasmuch as it is the simplest way of telling roughly the caking property of a coal. The amount and nature of the inorganic matter contained in the coal affects the above test to a certain extent, and in this connexion it may be mentioned that colorimetry has already been suggested by Gross and Abramsky[7] for the estimation of the ash content of coals.

Preliminary Examination of the Caking Properties of Coals

Determination of the so-called "caking index" does not always give concordant results, and often the order of indices is reversed when determined by different methods, or even by different operators using the same method. In the British Standard Method for the "Determination of the Agglutinating Values of Coal"[8] (modified Gray-Campredon method), it is stated that "the test is empirical in form and it has been ascertained that, while an individual can obtain concordant results, a high degree of concordancy is not to be expected between different operators."

For obtaining a preliminary knowledge of the caking property of a coal, Kattwinkel's apparatus[9] was found to have interesting possibilities.

About one gramme of coal powder, briquette or lump is put into a transparent silica tube and heated up to 500° in an aluminium retort, provided with a mica sheet window, which permits inspection of the state of coal in the tube from outside during carbonization. The retort is covered with a heat-protector and heated by a gas-burner, the rise of temperature being measured by a thermometer inserted into the wall of the retort. The tube is connected, through its side limb, with a suitable condensing apparatus. In my experiments the standard rate of heating was fixed as follows:

Up to 200°—in 10 minutes.
200°-300°—10° per minute.
300°-500°— 5° per minute.

During carbonization the following critical points may be noted:

(*a*) Bitumen decomposition point.—This is the temperature at which an oily product begins to condense in the upper part of the tube or in the side limb thereof.

(*b*) Coking point.—This is the temperature at which the coking starts, which is manifested, in the case of a briquette, by the loss of the original lustre of its surface and the fusion of the coal particles with simultaneous formation of a cell structure; and in the case of a powder, by the starting of fusion and wetting.

(*c*) Solidifying point.—This is the temperature at which the swelling of the plastic mass apparently ceases.

(*d*) Plastic range.—The temperature range between the coking point and the solidifying point.

As an example, in Table II are given the results obtained upon two coal samples, one being a typical gas coal and the other a good coking coal.

TABLE II.

MACROSCOPIC OBSERVATION OF THE COKING PROCESS.

Coal.	A. Bitumen decomposition point.	B. Coking point.	C. Solidifying point.	D. Plastic range.	Yield of semi-coke at 500° (dry basis).
Gas coal (Yubari)	337°	417°	463°	46°	71.3%
Coking coal (Poshan) ...	359°	431°	471°	40	89.4%

Contraction and Expansion of Coals on Heating

The plasticity and swelling of coals when subjected to thermal treatment are very important factors which determine their value for coke making. A great deal of research work upon this subject has already been undertaken by numerous experts, and some of the more important literature in this domain with special reference to blending has been cited in Dr. King's paper, "The Gray-King Assay as a Means of Control in Gas Manufacture."[10]

Several apparatus have been suggested for the measurement of swelling of coals, among which are noted the apparatus of Audibert,[11] of Sheffield University,[12] of Woodall-Duckham Companies,[13] of the South Metropolitan Gas Company,[14] of the Central Laboratory of the State Mines of Holland,[15] and of French origin[16] (Methods of O.C.C.R., of Arnu, and of Cassan (C.G.C.F.)).

The apparatus of my design, called the K-B-S apparatus (Kattwinkel-Baum-Shimomura), has already been fully described in "Fuel in Science and Practice,"[17] but a brief description will be repeated here. Fig. 2 shows the general arrangement of the K.B.S. apparatus.

One gramme of air-dried coal powder (through 65 Tyler mesh 0.208 mm.) is put into a silica tube (diameter = 15 mm., height = 120 mm.), which is housed in an aluminium retort with a heat-protector. The retort is heated by a gas burner, the amount of gas being adjusted by a micrometer tap so as to maintain a rate of heating similar to that of Kattwinkel's apparatus, as follows:

Up to 200°—in 10 minutes.
200°-300°—10° per minute.
300°-500°— 5° per minute.

As the weight to be put on the coal mass is adjustable, it is of interest to carry out experiments under two different conditions—first, when the weights are balanced—*i.e.*, when there is no pressure acting on the coal mass except the very small frictional resistance of the apparatus (case A); and, secondly, when a considerable amount of pressure (74.5 gramme/cm^2 in my experiments) is exerted on the coal (case B).

For swelling coals, in case A, the curve runs at first almost horizontal until at a certain temperature, when the coal becomes plastic, it begins to ascend more or less abruptly, and after the expansion has ceased the curve becomes almost horizontal again up to 500°, the final temperature attained in this experiment. In case B, contraction is observed prior to actual expansion due to softening and compression of the coal mass, followed by expansion, which, however, is soon checked on account of the load acting on the top of the mass, and an "equilibrium range," with an undulating type of curve, continues for some time, during which either the surface tension of the molten coal or its viscosity is in equilibrium with the downward pressure of the weighted piston. As the temperature rises higher, the piston begins to penetrate into the molten coal when the viscosity or tension gives way before the weight of the piston, and finally comes to rest when the semi-coke solidifies and hinders further penetration of the piston.

For the closer examination and interpretation of the curves obtained by the K-B-S apparatus (called K-B-S curves), the following critical points and ranges are defined:

Case A.

E_1—Initial point of expansion—the temperature at which the curve begins to ascend more or less abruptly.

E_2—End point of expansion—the temperature at which the ascending curve becomes horizontal to the base line.

Expansion:

Range: Temperature range between E_1 and E_2.

Magnitude: $\frac{\text{Maximum height—original height}}{\text{Original height}} \times 100$ (%).

Case B.

C —Initial point of contraction—the temperature at which the curve begins to descend from the horizontal. This point is somewhat indefinite, as the slope is very gradual.

E_1—Initial point of expansion—the temperature at which the curve begins to rise.

E_2—End point of expansion—the temperature at which the ascending curve becomes more or less horizontal. Generally, the first such point is taken, but for a curve in which several such points are shown the most prominent one may be taken as E_2.

P_1—Initial point of penetration—the temperature at which the nearly horizontal curve begins to descend more or less abruptly. As a principle, the last such point is taken.

P_2—End point of penetration—the temperature at which the descending curve becomes horizontal to the base line. This is sometimes rather indefinite.

Contraction:

Range: Temperature range between C and E_1.

Magnitude: $\frac{\text{Original height—Height at } E_1}{\text{Original height}} \times 100$ (%).

Expansion:

Range: Temperature range between E_1 and E_2.

Magnitude: $\frac{\text{Maximum height—Height at } E_1}{\text{Original height}} \times 100$ (%).

Equilibrium range: Temperature range between E_2 and P_1.

Penetration:

Range: Temperature range between P_1 and P_2.

Magnitude: $\frac{\text{Maximum height—Height at } P_2}{\text{Original height}} \times 100$ (%).

With the K-B-S apparatus, the yield of semi-coke at 500° can also be determined.

TABLE III.

INTERPRETATION OF THE K-B-S CURVES OF "M" (DURHAM) AND "E" (DERBYSHIRE).

Case A.

Coal.	E_1	E_2	Expansion		Yield of semi-coke at 500°
			Range.	Magnitude.	
Durham coal "M"	422°	472°	50°	435%	85.0%
Derbyshire coal "E"	—	—	—	—	74.4%

Case B.

Coal.	C.	E_1	E_2	P_1	P_2
Durham coal "M"	398°	420°	454°	483°	490°
Derbyshire coal "E"	395°	445°	—	—	—

Contraction.		Expansion.		Equilibrium.	Penetration.	
Range.	Magnitude.	Range.	Magnitude.	Range.	Range.	Magnitude.
22°	15.5%	34°	152%	29°	7°	52%
50°	15%	—	—	—	—	—

As an example, there is reproduced, in Fig. 3, the K-B-S curves of two English coals, and their interpretation is given in Table III.

In general, coals may be classified in the following groups by the forms of their K-B-S curves.

Class I
- *Ia.* Excessively swelling (expansion: more than 400%) with low viscosity.
- *Ib.* Excessively swelling (expansion: more than 400%) with high viscosity.

(Example: "M.")

Class II
- *IIa.* Highly swelling (expansion: 100 to 400%) with low viscosity.
- *IIb.* Highly swelling (expansion: 100 to 400%) with high viscosity.

(Examples: "K," "L," and "O.")

Class III
- *IIIa.* Moderately swelling (expansion: 50 to 100%) with low viscosity.
- *IIIb.* Moderately swelling (expansion: 50 to 100%) with high viscosity.

(Examples: "A" and "N.")

Class IV. Caking without appreciable swelling (expansion: less than 50%).

(Examples: "B," "C," "F," "H," "J," and "P.")

Class V. Imperfectly caking without swelling.

(Examples: "E," "G," "I," "1," "2," "3," "4," and "5.")

Class VI.—Non-caking.

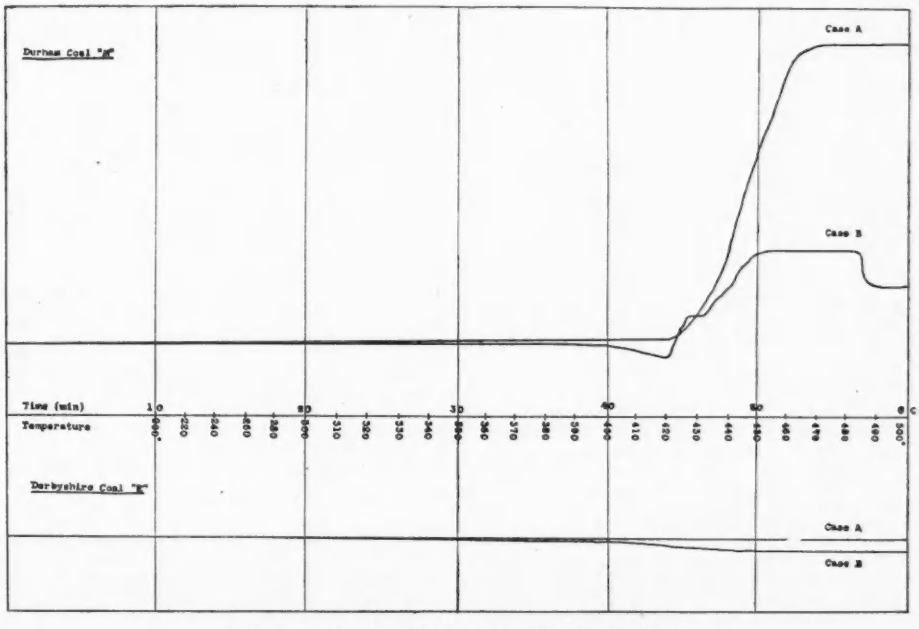


Fig. 3—K-B-S curves of Durham and Derbyshire Coals

Coals belonging to Classes II*b* and III*b* are generally good coking coals, with those of Class IV following. Coals of Class I*b* also give excellent cokes in actual practice, but it must be borne in mind that so-called "dangerous coals" are often found in this class.

Coals that swell more or less, but show low viscosity in a fused state, such as those belonging to Class I*a*, II*a* and III*a*, can, of course, be employed for coke manufacture, but the cokes obtained from such coals are often fingery in structure, and have rather low shatter indices. Most Japanese caking coals belong to these categories. Satisfactory blast furnace or foundry cokes can be made from such coals by a suitable blending prior to carbonization.

Driving-Pressure of Coals

The so-called "swelling-pressure," the German "Treibdruck," has attracted much attention from coke oven operating engineers and from those who build ovens first in Germany, and later in England and in other countries also.

Much light was first thrown on the theory of this pressure by the work of Damm,[18] Hofmeister,[19] the engineering staff of the H. Koppers A.G.,[20] Baum and Heuser,[21] and Foxwell,[22]. For measuring the pressure during carbonization, several appliances have been suggested for laboratory use, *e.g.*, the apparatus of Schreiber,[23] of Korten and Damm,[18] of Koppers,[20] of Baum and Heuser,[21] of Nedelmann,[24], of Taylor,[25] and of the Bureau of Mines.[26] In my laboratory I employ the Nedelmann apparatus, which is simple to manipulate, and so far has given entire satisfaction.

Recently, two important papers on the driving-pressure have appeared in English journals, one being by Dr. Foxwell,[27] entitled "Dangerous Swelling Pressures in Carbonization Practice," and the other by Dr. Mott and Mr. Spooner,[28] entitled "Assessment of Coals Liable to Damage Oven Walls." Although the results and conclusions obtained by these Authors are not always in entire agreement, they certainly show the highly important nature of this type of research work in the domain of coke manufacture.

Another interesting Paper, entitled "Neue Beobachtungen zur Aufklärung des Treibens der Kohlen," was recently published by Dr. Bunte and Imhof,[29] who found, by using a new apparatus in which only 5 grammes of coal were employed in a thin layer (8 mm.), that the pressure was always manifested at an early stage—viz., between 100° and 400°, reaching a maximum at about 320° to 350° before the fusion of coal actually started. They compared this pressure with the degree of swelling of coal and the Foxwell plasticity curve, and came to the conclusion that the

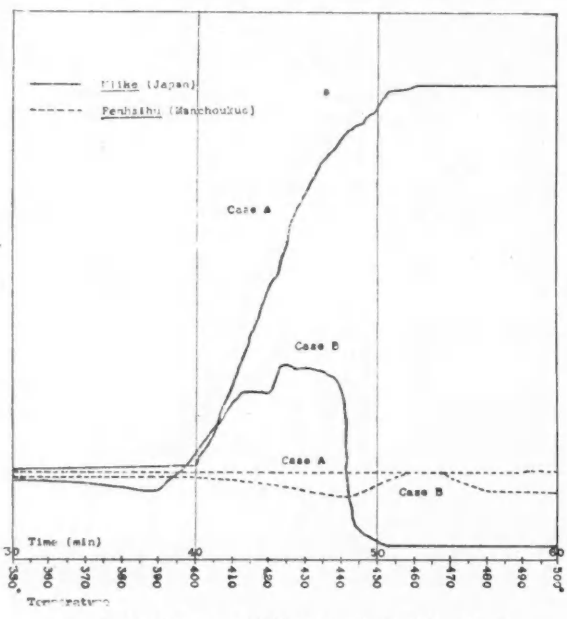


Fig. 4—K-B-S curves of "Miike" and "Penhsihu" coals

pressure is independent of either of the former two phenomena, and is due to the phenomenon of intumescence ("Quellungserscheinung"), which is to be attributed to depolymerization of the coal structure. The Authors would rather designate this pressure as "Quellungsdruck" in contradistinction to the ordinary "Treibdruck," which is an arithmetic sum of all the forces acting at different temperatures in a mass of coal semi-coke coke.

In this Paper I venture to use a term, "driving-pressure," as more suitable than the "swelling-pressure" commonly used in English literature as an equivalent of German "Treibdruck," for the latter is apt to invite confusion in its meaning. In fact, highly swelling coals do not always show high pressure, and *vice versa*. In this respect, Mr. Spiers[30] seems to entertain a similar view to mine, and stated in the discussion on Dr. Foxwell's Paper[27] that "It is a fact that the swelling characteristics of different coals seem to bear no relationship to the pressure-generating characteristics of the coals. For example, some coals which exhibit a high swelling in the crucible swelling test or in a test of the nature of the Sheffield coking test may give rise to a low swelling pressure and *vice versa*. On the other hand, highly swelling coals which contain more than 30% of volatile matter, never, apparently, give an indication of dangerous swelling pressure at normal or moderately high charging densities."

The following examples will illustrate the argument.

In Japan there are many coals having rather high content of volatile matter, which swell considerably but show little or no pressure and which produce cokes of inferior quality when carbonized unblended. Such coals have rather low fusion point, and once fused the coals show very low viscosity. As a typical example of these coals (Class I*a* of the K-B-S. experiment), "Miike" may be instanced (V.M. = 43.2%, ash = 7.6%). K-B-S curve of which is represented in Fig. 4 (full line). Notwithstanding its excessive swelling (expansion = 486%), the driving-pressure of the coal, as measured by the Nedelmann apparatus, was only 0.02 kg/cm², and the range of maximum decomposition lay between 440° to 460°. Moreover, as much as 50.4% (dry, ashless basis) dissolved in boiling phenol. This is a clear instance of swelling and pressure being quite independent of each other. Another example, in which swelling and pressure are not concomitant, is "Penhsihu-Low Phosphorus" coal (Manchoukuo) (V.M. = 21.1%, ash = 12.8%), the K-B-S curve of which is also shown in Fig. 6 (dotted line). This coal produces a good blast furnace coke, but is liable to damage coke oven walls in practice. In spite of its low swelling power—apparently there is no intumescence at all in a free state (Case A)—it manifested the very high pressure of 0.40 kg/cm² with the Nedelmann apparatus. The small intumescence shown in Case B of the K-B-S curve seems to be responsible for this high pressure, for, however small it may be, it is possible to give rise to a high pressure if the cell membrane of the plastic coal is so tough as to withstand the internal gas pressure. The range of maximum decomposition of the coal lay rather high, viz., 480° to 500°. The last case, in which swelling and pressure incidentally coincide, may be illustrated by the examples of the Durham coal "M" and the Derbyshire coal "E," of which K-B-S curves are shown in Fig. 3. The Durham coal manifested an excessive swelling amounting to 435%, and also a comparatively high driving-pressure of 0.30 kg/cm², while the Derbyshire coal did not show any swelling, and the pressure was negligible.

The driving-pressure, apart from the type of apparatus employed and the amount of inorganic matter contained in the coal sample, depends on various experimental factors, such as the bulk density of the coal mass, the grain size, the moisture content of the coal, the heating rate, and the maximum temperature attained, as well as the direction of penetration of the heat. Hence, it is necessary to standardize the working conditions in order to get comparable values for the driving-pressures. In my experiments with the Nedelmann apparatus the conditions were fixed as follows:

Sample: 120 grammes of dry coal passed 10 Tyler mesh (1.651 mm.) with 10% moisture content.

Bulk density of the charge: 0.77 on wet coal.

Maximum temperature attained: About 800° in the lower part, reaching about 700° within one hour.

The maximum driving-pressure shown by the British coal samples are shown in Table IV.

South Wales	A.	0.04	Durham	K.	0.18
	B.	0.03		L.	0.40
	C.	0.02		M.	0.30
				N.	0.08
				O.	0.31
	E.	0.02			
Derbyshire	F.	0.05	Staffordshire	P.	0.06
	G.	0.02			
	H.	0.08		1.	Nil
				2.	0.01
			Nottinghamshire ...	3.	0.03
Yorkshire	I.	0.04		4.	0.01
	J.	0.11		5.	0.02

Owing to a certain resemblance between the manner of heating the Nedelmann retort with that of a coke oven—viz., a quick-heating under pressure and one-way penetration of heat, it is interesting to study the physical aspect of the experimental coke as a means of forecasting the nature of the industrial coke.

In general, there are two kinds of coals that are entirely or virtually devoid of driving-pressures—one being the non-caking coals, including anthracite, semi-coke, highly oxygenated or weathered coals, and the other being coals which, although strongly caking and swelling, are easily fusible to a mass of low viscosity, such as the "Miike" coal (see Fig. 4), and most of the Japanese caking coals.

Experiments with blended coals have shown that the driving-pressure is not the arithmetic mean of those of the components, but is reduced to zero or almost, so if one or more non-driving coals of either type described above be added in a fair proportion even to a highly driving coal. In this respect, I differ from the view of Dr. Siegl,[31] who stated, in the discussion on Dr. Foxwell's Paper,[27] that "with coal blends, the swelling-pressure of the mixture is practically proportional to the pressures of the various materials constituting the mixture."

In Japan high-grade foundry cokes are always made from a blend in which are incorporated native high volatile low fusible

coal (devoid of driving-pressure), native or Chinese low volatile coking coal (generating driving-pressure), and/or Indo-Chinese anthracite (showing no driving-pressure). Such a blend shows practically no pressure when examined by the Nedelmann apparatus. Moreover, such a blend in actual coking practice, even in stamped charges, offers no trouble whatever.

It is evident that there are two ways of making so-called dangerous coals harmless. One method is to blend the coal in a suitable proportion, which need not be large, with some sandy materials such as coke-breeze, semi-coke, fusain, &c., which generate no driving-pressure, and the other is to blend with coals of low fusibility and low viscosity that show practically no driving-pressures.

One of the desiderata of a good coke is that it should consist of uniform pores with strong cell structure. For this it is necessary that during carbonization there shall be formed a viscous or tough membrane of molten coal which is not easily broken by the gas pressure developed inside the enclosed cell. It can be imagined that this condition will invariably lead to a high driving-pressure at a certain period. It is considered, therefore, that to show an appreciable driving-pressure, say, 0.1 kg/cm² by the Nedelmann apparatus, is a welcome sign of a good coking coal.

The possibility of assessing dangerous coals by the empirical measurement of their driving-pressures alone seems to be a subject that is under discussion by experts at present. In this respect I do not venture to define a so-called dangerous pressure by laboratory experiment; but I will assert that coals showing a high driving-pressure in the laboratory test are not always dangerous in practice, but on the other hand, coals which are dangerous always show high driving-pressures in laboratory tests. In addition, the content of inorganic matter in the coal samples affects the magnitude of the driving-pressure to a great extent.

For instance, it often happens that while a run-of-mine coal shows very little or no pressure, a purified coal, in which the ash content has been reduced by cleaning, can manifest an excessive pressure. Hence too much importance must not be attached to the magnitude of the driving-pressure alone.

Evolution of Volatile Matter from Coals

As it is obvious that both the swelling and the driving-pressure of coals have a close relation to their gasification during carbonization, it is desirable to investigate the manner of evolution of volatile matter (water, gas, and tar combined), in order to obtain a better understanding of the behaviour of coals on heating. Study in this direction has already been undertaken by many investigators, and special thermal balances for such an investigation have been proposed by Audibert,[11] Peters,[32] Jenkner and Hoffmann,[33] and others.

The balance which I have designed for this purpose is different from those appliances suggested by the foregoing investigators inasmuch as it dispenses with the use of weights, except in the initial zero-point setting, and is so constructed as to indicate automatically the changing weight at any instant.

A transparent silica tube (diameter = 20 mm., height = 125 mm.) is suspended from one end of the arm of the indicating balance by means of a platinum wire in an electric furnace; the balance is placed on a stand, the height of which can be adjusted by a screw arrangement. The scale of the balance is graduated from 0 to 1.00 gramme in sub-division of 0.02 gramme on one side, and from 0 to 50% in sub-divisions of 1% on the other. Two grammes of air-dried coal (through 65 Tyler mesh, 0.208 mm.) are put into the silica tube, and a perforated porcelain disc with a handle of platinum wire is put on the top of the coal mass in order to prevent undue oxidation during heating. The opening of the furnace is covered with a silica plate having a small hole in its centre through which passes the platinum wire holding the tube. The pointer of the balance is adjusted to zero-point prior to the start of the experiment by adding a suitable weight on the pan situated between the end of the arm and the silica tube. The furnace is heated at a constant rate of 7° to 8° per minute, and the reading of the balance, directly in percentages, is taken every 20° up to 900°. In order to keep constant the distance between the silica tube and the thermo-couple fixed in the furnace, the stand is raised gradually in accordance with the rise of the tube as the volatile matter is driven off.

In this experiment, it is not necessary to conduct the heating in an inert gas, as it has been ascertained that the result obtained in an atmosphere of CO_2 was practically the same as that conducted without such a precaution. The total volatile matter measured in this slow heating, however, differed considerably from that obtained in the usual method of volatile matter estimation in a platinum crucible, owing to adhesion of carbon formed by the cracking of hydrocarbon gases and tar inside the tube. If, on the other hand, the tube containing the sample is quickly inserted into a furnace which is already kept at 900°, most of the volatile matter is driven off within 15 minutes as shown in the table in next column.

The temperature at which the rate of evolution of volatile matter reaches its maximum has an important bearing on the coking property of coals. Most coking coals have their temperature of maximum rate of evolution of volatile matter above 460° C. and below 500° C.; while those having the maximum rate at 440° to 460° C. do not give satisfactory cokes in practice.

Coals that give off more than 50% of their total volatile matter within a temperature range of 400° to 600° are generally caking,

Amount of Volatile Matter (Moisture included).

Coal.	Crucible method.	Tube method.			
		Slow heating (7 to 8°/min.) up to 900°	Quick insertion at 900° after		
			3 min.	15 min.	60 min.
Gas coal (Y) ...	45.2%	36.0%	42.0%	44.5%	47.0%
Coking coal (D) ...	28.2	23.0	25.5	27.2	29.7

and the higher the percentage the more swelling are the coals in a broad sense.

By comparing these figures with the results of the K-B-S experiment it has been shown that the initial point of expansion generally corresponds to the temperature at which the evolution of volatile matter increases more or less abruptly. However, with coals of less highly swelling character, the former point lies somewhat higher than the latter temperature. Moreover, the end point of expansion in the K-B-S experiment very nearly agrees with the temperature at which the rate of evolution of volatile matter reaches its maximum. It was also found that coals with comparatively high driving-pressures have their temperature of maximum rate of volatile matter evolution at 460° to 480° or higher.

Desiderata for Coking Coals

Coking coals, in general, may be divided into two groups—"soft" and "hard" coals—from their coking properties. By a "soft" coal or blend is meant a coal or blend which softens and fuses at comparatively low temperatures, the fusion point being below 430°, which swells considerably without, however, manifesting an appreciable driving-pressure due to low viscosity of the fused mass, and which has a temperature of maximum rate of evolution of volatile matter lower than 460°. Coke made from a "soft" coal or blend is generally highly fissured, often fingery in structure, and is friable; but slow heating in a coke oven and stamped charging often improve the qualities of coke made from such a coal or blend. By a "hard" coal or blend is meant a coal or blend which softens and fuses at comparatively high temperatures, the fusion point being above 430°, and swells only moderately, showing, at the same time, a fair amount of a driving-pressure due to high viscosity of the molten mass, and having the maximum rate of evolution of volatile matter at a temperature higher than 460°. Such a coal or blend is generally suitable for fast coking in modern coke ovens, but care must be taken with a "hard" coal whose driving-pressure is too high. Dangerous coals of this character may, however, be made harmless by modifying the bulk density of the charge, or by blending with some suitable materials that, as mentioned before, do not generate a driving-pressure.

Blending is an artificial imitation of what nature has done, and it is not impossible to convert any "soft" coal into a "hard" one or into something very near to it by means of suitable blending.[34] Based on the results of experiments in the laboratory, and at the same time taking into consideration works' results, I venture to propose the following criteria as the desiderata for a coal or blend suitable for coke manufacture:

Analysis.

Ash	As low as possible.
Volatile matter ...	20 to 30% (dry basis).
Phenol-extract ...	15 to 35% (dry, ash-free basis).
Carbon	85 to 89% (")
Hydrogen	4.5 to 5.5% (")
Oxygen	5 to 8% (")

K-B-S Experiment.

Type A	Initial point of expansion	... about or higher than 430°
	End point of expansion	... about or higher than 470°
	Magnitude of expansion	... more than 50%, but less than 200%
Type B	Initial point of expansion	... about or higher than 420°
	Initial point of penetration	... about or higher than 460°
	Magnitude of expansion	... about or higher than 50%
	Magnitude of penetration	... less than 20%

Driving-pressure (by Nedelmann's apparatus) about 0.1 kg/cm²

Range of maximum rate of evolution of volatile matter ... ... 460 to 500°

References

1. R. A. Mott and R. V. Wheeler. *Fuel*, 1932, xi, 204-213.
2. Wheeler's Method of Extraction. *J.C.S.*, 1913, ciii, 1704; 1916, cix, 707, &c.
3. Fischer's Method of Extraction. *Brenn.-Chem.*, 1924, v. 299; 1925, vi, 33, &c.
4. S. W. Parr and H. F. Hadley. Bull. 76, Univ. Illinois Eng. Exp. Station, 1914; *Fuel*, 1925, iv, 31-38; 49-55; 111-118.
5. M. Barash. *Gas Journal*, Coke Competition No., 1925, Nov. 9, 17-27.
6. R. A. Mott. *Fuel*, 1925, iv, 467.
7. W. Gross and C. Abramsky. *Glückauf*, 1930, lxvi, 1579; *Fuel*, 1932, xi, 154-158.
8. "British Standard Method for the Determination of the Agglutinating Value of Coal," British Standard Institution, No. 705, Sept. 1936.
9. R. Kattwinkel. *Brenn.-Chem.*, 1930, xi, 329-330
10. J. G. King. *Journal Inst. Fuel*, 1939, xii, 350-362.
11. E. Audibert. *Rev. de l'Industrie minérale*, 1926, vi, 115; 1927, vii, 1; *Fuel*, 1926, v, 229-244; 1927, vi, 131-140, 182-189.

12. R. A. MOTT and R. V. WHEELER : *Fuel*, 1932, xi, 204-213. R. G. DAVIES and R. A. MOTT ; *Fuel*, 1933, xii, 294-303. R. A. MOTT and C. E. SPOONER : *Fuel*, 1937, xvi, 4-14.
13. Dr. E. W. SMITH's private communication.
14. Chem. Dept. of the South Metropolitan Gas Co. *Fuel*, 1936, xv, 36-39.
15. H. A. J. PIETERS. *Rec. Trav. Chim. Pays-Bas*, 1931, T.50, 7-8, 856-859.
16. H. CASSAN ; *Charleur et Industrie*, Nov., 1935 ; *Journal Usines à Gaz*, 1936, lx, 145-157. L. BRO : *Journal Usines à Gaz*, 1938, lxii, 465-472.
17. A. SHIMOMURA. *Fuel*, 1932, xi, 340-343.
18. P. DAMM. *Glückauf*, 1928, lxiv, 1073-1080, 1105-1111 ; *Fuel*, 1929, viii, 163-177.
19. B. HOFMEISTER. *Glückauf*, 1930, lxvi, 325-332, 365-372.
20. H. KOPPERS : *Koppers Mitteilungen*, 1930, Heft 1, 1-23. H. KOPPERS and A. JENKNER : *Glückauf*, 1931, lxvii, 353-362.
21. K. BAUM and P. HEUSER. *Glückauf*, 1930, lxvi, 1497, 1538. *Fuel*, 1931, x, 51-64.
22. G. E. FOXWELL. *Fuel*, 1932, xi, 370-377.
23. SCHREIBER. *Stahl & Eisen*, 1920, 1278.
24. H. NEDELMANN. *Brenn.-Chem.*, 1931, xii, 42-43.
25. J. TAYLOR. *Fuel*, 1931, x, 390-393.
26. H. S. AUVIL and J. D. DAVIS. Bureau of Mines Rept. 3403, May, 1938 *Fuel*, 1938, xvii, 335-348.
27. G. E. FOXWELL. *Journal Inst. Fuel*, 1939, xii, 281-300.
28. R. A. MOTT and C. E. SPOONER. *Fuel*, 1939, xviii, 329-344, 371-379.
29. K. BUNTE and HANS IMHOF. *G.W.F.*, 1939, lxxxii, 805-812.
30. H. M. SPIERS. *Journal Inst. Fuel*, 1939, xii, 293-294.
31. SIEGL. *Journal Inst. Fuel*, 1939, xii, 292.
32. H. A. J. PIETERS : *Rec. Trav. Chim. Pays-Bas*, 1931, T.50, 7-8, 865-873 ; *Fuel*, 1931, x, 484-488. H. A. J. PIETERS and H. KOOPMANS : *Brenn.-Chem.*, 1932, xiii, 261-264.
33. A. JENKNER and E. HOFFMANN. *Brenn.-Chem.*, 1932, xiii, 181-187.
34. A. SHIMOMURA. *Fuel*, 1934, xiii, 262-268.

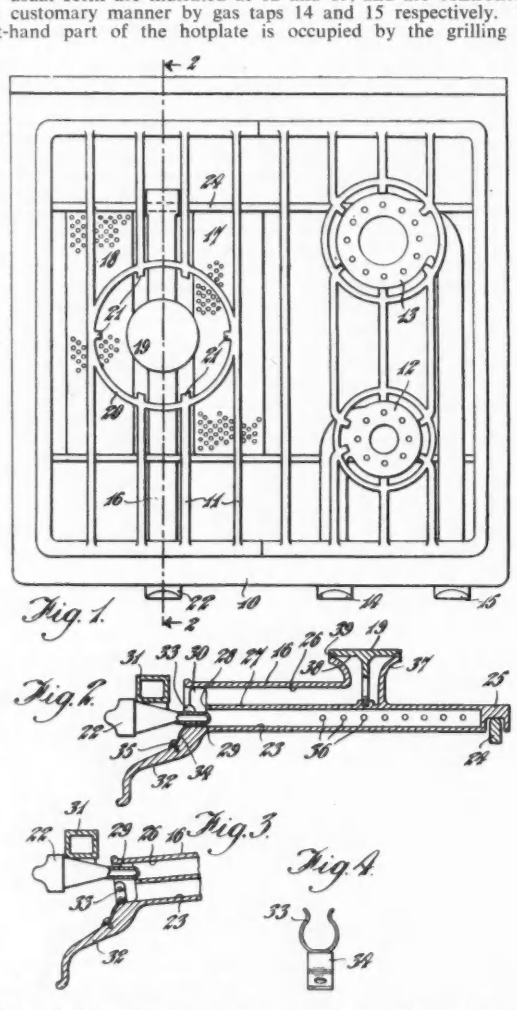
NEW PATENTS

Combined Grill and Boiling Burner

A patent (No. 524,463 ; application date, Jan. 30, 1939) for a combined grill and boiling burner for gas cookers, has been taken out by the Emscote Foundry Co., Ltd., and F. Harvey.

Fig. 1 is a plan view of the hotplate of a gas cooker incorporating the combined grilling and boiling device ; Fig. 2 is a sectional elevation taken on the line 2—2 of Fig. 1 ; Fig. 3 is a fragmentary sectional elevation corresponding to the left-hand part of Fig. 2 ; and Fig. 4 is a front elevation of the clip for supporting the mixing tubes.

The hotplate shown in Fig. 1 comprises a framework 10 provided with a hotplate grid 11 for the purpose of supporting saucepans and other utensils to be heated. Two boiling burners of the usual form are indicated at 12 and 13, and are controlled in the customary manner by gas taps 14 and 15 respectively. The left-hand part of the hotplate is occupied by the grilling and



boiling device, which comprises a duplex mixing tube casting 16 and is arranged either to heat a pair of metal or other radiating elements 17 and 18 or to operate a boiling burner indicated at 19. For the benefit of the latter the hotplate grid 11 is shaped with a ring 20 and inwardly extending projections 21 to support a saucepan or other utensil. The combined burner device is controlled by a single gas tap 22, and its construction will be seen more clearly in Figs. 2 and 3.

A grill burner mixing tube 23 of the usual straight form is supported at its rear end upon a transverse member 24 carried by the frame 10, a notched projection 25 upon the mixing tube 23 being arranged to form a pivotal bearing of the knife-edge type. A mixing tube 26 for the boiling burner 19 is cast integrally with the mixing tube 23 and the partition wall 27 between the two tubes is foreshortened at 28 so as to clear the end of a gas injection nozzle 29. This, as will be seen in Fig. 2, extends into a common cavity 30 at the mouth of the two mixing tubes 23 and 26, and is fed with gas from a transverse conduit 31 extending along the front of the hotplate. The casting 16 is adapted to be raised and lowered about its pivotal mounting 24, 25, by a handle 32, and in Fig. 2 it is shown in its raised position with the gas injection nozzle 29 disposed in alignment with the grill burner mixing tube 23. To support the burner in this position a substantially U-shaped clip 33 composed of spring steel is positioned within the cavity 30 and is fixed by a lug 34 and screw 35. When the casting 16 is thus raised the gas issuing from the nozzle 29 passes along the mixing tube 23 and issues at each side of the burner through apertures 36 so that the flames impinge upon the radiating elements 17 and 18. In order to bring the boiling burner 19 into action downward pressure is applied to the handle 32, with the result that the spring clip 33 becomes released from the nozzle 29 and the latter then supports the casting 16 in the position shown in Fig. 3. The gas issuing from the nozzle passes along the mixing tube 26 and thus feeds the boiling burner 19. This burner can, of course, be of any convenient construction, and in the form shown in Fig. 2 the mixing tube 26 terminates in a substantially funnel-shaped portion 37 which is almost closed by a disc-like cap 38 having around its circumference a series of oblique nozzles 39 through which the gas-air mixture escapes to provide the usual radial flames for heating saucepans, kettles, and other utensils.

It is usually found that the clearance which is necessary to provide the relative movement between the duplex burner 16 and the injection nozzle 29 gives a suffcient passageway for the entrance of primary air to either burner, but it may be desirable in some cases to enlarge this opening or to provide additional openings, or perhaps to close off the end of the tube by the provision of a plate which is secured to the gas nozzle.

Automatic Controller for Gas Governors

A patent (No. 523,796; application date, Jan. 14, 1939) has been granted to M. L. Smith, which relates to automatic control of retort house governors.

Means are provided which are controlled by the pressure in the foul main whereby the direct loading on the pressure responsive device is decreased or the counter-balance load is increased as the foul main pressure rises.

It is claimed that the improved construction and arrangement will overcome inertia and friction, and counteract the variations in the weight of the bell in the retort house governor as it moves in and out of the water.

Fig. 1 is a diagrammatic illustration of part of the apparatus; Fig. 2 is an illustration of apparatus for use in conjunction with the apparatus shown in Fig. 1; and Fig. 3 shows the association of the apparatus illustrated in Figs. 1 and 2 with a retort house governor.

Apparatus according to the invention consists of a cylindrical metal tank *a* containing water and suspended from the counterbalance *cb* of a retort house governor R.H.G., as shown in Fig. 3, by means of a centre post *b*, this centre post being slotted and drilled in a convenient place to carry the beam *c* of a balance. Suspended at one end of the beam *c* is a bell *d* floating in a constant level water container *e*, and the gas supply *f* to the bell is taken from the foul main by a flexible connexion. From the opposite end of the beam a glass cylinder *g* is suspended, and this cylinder dips in or on to a mercury cup *h* provided with a central outlet *i*, connexions *j* being made under the tank from the mercury cup to the container *e* and from an overflow *k* from the container to a drain pipe.

By adjusting the balance by weights to the desired vacuum or pressure required in the foul main, a slight increase in vacuum or

(*Please turn to page 40.*)

Gas Undertakings' Results

Alloa

The financial operations of the Alloa Corporation Gas Department over the past twelve months have resulted in a gross profit of £19,813, which compares with an estimate of £17,260. After meeting loan and interest charges, there remains a net profit of £2,226, whereas the estimate was £739. No war increase was made in the price of gas. There has been an increase of 4,000,000 cu.ft. in the quantity of gas sold, in spite of a loss of 17,000,000 cu.ft. in the consumption for public lighting. The sum received for residuals—coke, road tar and tar products, sulphate of ammonia, and benzole—represents a return of 74.66% on the cost of coal. Benzole recovery shows a net profit of £1,675, carbonizing approximately 20,000 tons of coal per annum. The benzole plant was installed five years ago, and has proved remunerative, the first cost having been written off in two years.

Belfast

The quantity of gas made by the Belfast Corporation Gas Department during the past financial year was 4,177,000,000 cu.ft. After the outbreak of war, there was a drop of 15% in sales of gas, and this continued for several months. Later, however, some recovery took place, so that over the whole year the decrease worked out at less than 8%. Almost the whole of this decrease, too, was accounted for by the cessation of public lighting, which was responsible for a drop in output of almost 300,000,000 cu.ft. There is a decrease of £4,403 in the gross profit, at £103,714. The net profit is £38,174, and after various allocations there remains a balance of £232 to be carried forward.

Birmingham

An improvement in the position of the Birmingham Corporation Gas Undertaking as compared with the beginning of the war is revealed in the annual report to the City Council. There is a surplus on the trading during the past financial year of £86,456, which compares with a deficit of £89,688 in the preceding year. Over the full year, sales of gas show a reduction of 210,024,100 cu.ft., which is equivalent to about 1.32%. In the last few months, owing to the demand for gas for manufacturing purposes, the increased consumption has more than accounted for the loss of output due to cessation of public lighting.

Bolton

It has been stated at a meeting of the Bolton Town Council that during the years 1936 to 1938 the profits of the Gas Department dropped from over £6,000 to £21, while the operations during the subsequent financial year have resulted in a loss of £6,281—due chiefly to the rising price of coal. Since the war began, the Department has been faced by increasing costs combined with a reduction in output. The price of gas is to be increased to 12.38d. per therm.

Dublin

The total quantity of gas sold during the six months ended June 30 by the Alliance and Dublin Consumers' Gas Company was 7,540,187 therms. This compares with sales amounting to 7,238,295 therms in the corresponding half of 1939. The consumption for public lighting has been somewhat less (117,856 therms, as against 140,016 therms), the number of public lights having decreased from 3,607 to 3,509. The Accounts show a profit on Revenue Account of £69,008, which compares with £74,623 at this time last year. The payment of a dividend at the rate of 7% per annum on the consolidated ordinary stock will leave a balance of £1,686 to be carried to the next account. For the June half of last year the dividend was at the rate of 8% per annum, and the carry forward amounted to £12,514.

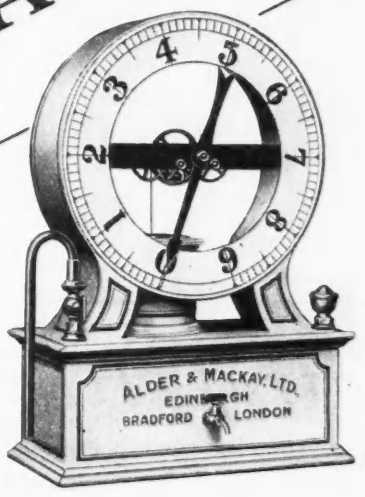
Motherwell and Wishaw

It is shown by the annual report of the Motherwell and Wishaw Gas Department that the make of gas during the twelve months ended May 15 last totalled 493,653,000 cu.ft., which represents an increase on the output for the preceding twelve months of 52,447,200 cu.ft., or 11.88%. The quantity of gas sold was 453,472,300 cu.ft.—an increase of 49,765,400 cu.ft. On the year's working there is a gross profit of £25,791, and after deducting interest and sinking fund charges there remains a credit balance of £277, giving, with last year's balance, a carry-forward of £5,925.

Stretford

The total quantity of gas made by the Stretford and District Gas Board during the year to March 31 last was 7,640,505 therms; the sales amounting to 7,144,705 therms—an increase of 361,321 therms, or 5.31%, which follows upon an increase of 5.28% for the preceding year. During the past financial year there has been an increase in the number of consumers of 771, or 2.3%. The figures show a gross balance on Revenue Account of £55,967, which compares with £59,023 a year ago. After providing for interest, sinking fund, and other charges, there remains a credit balance on Net Revenue Account for the year of £27. To this amount there falls to be added the credit balance of £9,656 standing in the Appropriation Account at March 31, 1939, bringing the total in that Account up to £9,683, which is being carried forward.

King's PRESSURE GAUGES



Illustrated is the Circle Gauge for 9" readings which is a particularly sensitive instrument. The brass spindle is located on roller bearings and the black figures are 1¼" high on a 14" diam. white enamelled dial. The filling plug and gas connection are interchangeable.

Further particulars of other gauges and prices will be sent on application.

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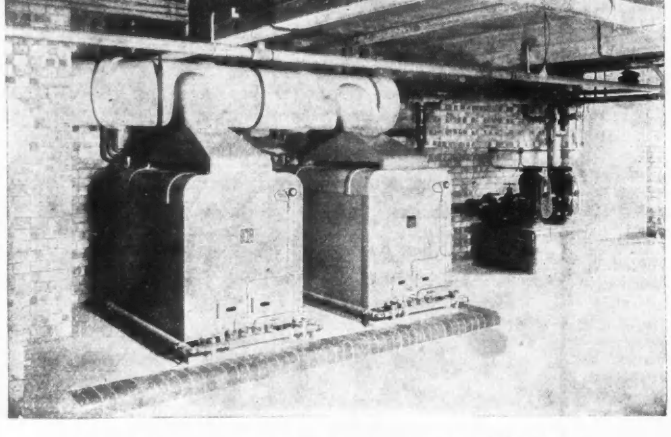

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Gas Products Prices

The London Market

Sept. 30.

There are no alterations to record in the value of Tar products in London, present values being as under: Pitch remains nominal, creosote is about 4⅜d. to 5d. per gallon, refined tar 3⅜d. to 4d., the price of pure toluene under the Ministry of Supply Toluene No. 2 Order is 2s. 5d. per gallon, pure benzole 1s. 10d., 95/160 solvent naphtha 1s. 11d. to 2s. 0d., and 90/160 pyridine about 17s. 6d. all per gallon naked, refined naphthalene crystals £23 per ton in bags, all *ex* Makers' Works.

The Provinces

Sept. 30.

The average prices of gas-works products during the week were: Pitch and Crude Tar.* Toluole, naked, North, 1s. 9½d. (Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North 9d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 4½d. to 1s. 5½d. Creosote, *ex* works, in bulk, North liquid and salty, 4½d. to 4⅝d.; Scotland, 4½d. to 4⅝d.; low gravity, 4½d. to 4⅝d. Fuel Grade, 4d. to 4½d. Carbolic acid, 60's, 3s. 6d. to 3s. 7½d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4⅝d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil, (min. gr. 1,080), 5¼d. to 5½d.; filtered heavy oil (min. gr. 1,080), 5⅜d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6¼d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note in our issue of Sept. 4, p. 404.

Scotland

GLASGOW, Sept. 28.

While new business is too plentiful deliveries are proceeding rapidly and prices generally continue steady.

Refined tar.—Throughput is on a modest scale but home price is maintained at 4¼d. to 4⅜d. per gallon, while for export supplies can be obtained at 3½d. per gallon, both f.o.r. naked.

Creosote oil.—There is a fair activity with supplies available at the following prices: Specification oil, 5d. to 5⅛d. per gallon; low gravity, 6d. to 6⅛d. per gallon; neutral oil, 5⅜d. to 6d. per gallon; all *ex* Works in bulk.

Cresylic acid remains rather difficult with quotations as under: Pale, 99/100%, 2s. 2d. to 2s. 4d. per gallon; Pale, 97/99%, 1s. 11d. to 2s. per gallon; Dark, 97/99%, 1s. 7d. to 1s. 9d. per gallon; all *ex* Works in buyers' packages.

Crude naphtha is valued at 6⅛d. to 7⅛d. per gallon *ex* Works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 8½d. to 1s. 9d. per gallon and 90/190 heavy naphtha is 1s. 4⅛d. to 1s. 5⅛d. per gallon.

Motor benzole is 1s. 9d. to 1s. 9½d. per gallon.

Pyridine.—90/160 grade is 17s. to 18s. per gallon and 90/140 grade is 19s. to 20s. per gallon.

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A.R.P.

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GAS STOCKS AND SHARES

Air raid warnings and shorter hours have both played a large part during recent weeks in curtailing the volume of business on the Stock Exchange, but despite these handicaps there was evidence of some increased activity last week. Gilt-edged stocks were once more the chief feature, and again closed fractionally higher—2½% Consols being ¼ up at 74¼. The pact of Japan with the Axis Powers led to falls in Japanese Bonds, but failed to affect British stocks. Some slight support for home rails was forthcoming at the end of the week, but prices remained practically unchanged. Several leading industrials improved, as also did mining shares, but oils and rubbers remained dull.

There was also a little more business done in the Gas Market last week, and with few exceptions prices in the Official List remained unchanged. It will be seen that Gas Light 3¼% debenture hardened 2 points to 82½. Several quotations at the Provincial Exchanges were brought more into line with current values, *e.g.*, Blyth fell 7½ to 102½, and Weston-super-Mare Consolidated and 4% debenture were marked down 6½ and 12½ respectively. There were no changes of importance in the Supplementary List.

The Directors of the British Gas Light Co., Ltd., have declared an interim dividend of 3% on the ordinary stock, which compares with 3½% a year ago. The stock fell 2 points to 80 on the announcement.

Quotations on the London and Provincial Stock Exchanges

OFFICIAL LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 27.	Rise or Fall on Week
1,767,439	Sept. 16	7	7	Alliance & Dublin Ord. ...	102—112	...
374,000	July 1	4	4	Do. 4 p.c. Deb. ...	90—95	...
957,608	May 13	5	5	Assed. Gas & Water U'd'ts Ord.	12/—14/	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	15/6—17/6	...
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6	...
336,646	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	12/—14/-	...
561,370	Aug. 12	7	7	Barnet Ord. 7 p.c.	100—105	...
300,000	Apl. 8	1/4½	1/9½	Bombay, Ltd.	19/6—21/6	...
690,407	Aug 19	7	7	Bournemouth 7 p.c. max. ...	100—110	...
362,025	June 17	4	4	Do. 4 p.c. Deb. ...	75—85	...
659,955	Aug. 19	6½	4½	Brighton, &c., 5 p.c. Con. ...	68—73	...
855,000	Mar. 11	7	8	Brit. Gas Light Ord.	75—85	−2
545,000	June 17	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	...
10,000	Nov. 6, '33	6	4	Cape Town, Ltd., 4½ p.c. Cu. Pf.	½—¾	...
626,860	July 15	5 7/10	6	Cardiff Con. Ord.	89—94	...
24,500	Sept. 23	7	7	Colombo Ord. 7 p.c. Pref. ...	19/—21/-*	−/6
764,169	Mar. 26	-/11.48	-/11.48	Colonial Ass'n. Ltd. Ord. ...	14/6—16/6	...
400,000	,,	1/3.30	1/3.30	Do. 8 p.c. Pref. ...	20/—22/-	...
1,748,935	July 22	2	3	Commercial Ord.	37—42	...
620,000	June 10	3	3	Do. 3 p.c. Deb.	58—63	...
286,344	Aug. 19	5	5	Do. 5 p.c. Deb.	88—93	...
807,560	Aug. 12	7	6	Croydon sliding scale ...	87—92	...
644,590	,,	5	5	Do. max. div.	90—85	...
620,385	July 1	5	5	Do. 5 p.c. Perp. Deb. ...	90—95	...
179,500	Aug. 19	5⅜	5	East Surrey 'B,' 5 p.c.	75—80	...
176,461	June 17	5	5	Do. 5 p.c. Deb. (Irred.)...	90—95	...
250,000	July 8	4	6	Gas Consolidation Ord. 'B' ...	13/—15/-	...
250,000	May 13	4	4	Do. 4 p.c. Red. Cum. Pref.	15-/—17/-	...
19,152410	July 29	3⅜	4½	Gas Light & Coke Ord. ...	13/—15/-a	...
2,600,000	,,	3½	3½	Do. 3½ p.c. max.	54—59	...
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	72—77	...
2,993,000	July 8	3¾	3¾	Do. 3¾ p.c. Red. Pref. ...	80—85	+2
8,602,497	June 3	3	3	Do. 3 p.c. Con. Deb. ...	65—70	...
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	99—104	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	98—103	...
700,000	Sept. 9	3½	3½	Do. 3½ Red. Deb. ...	80—85	...
5,600,000	May 13	4	8	Imperial Continental Cap. ...	37—42	...
43,820	July 29	3½	3½	Do. 3½ p.c. Red. Deb. ...	63—68	...
231,978	Aug. 19	5	5	M.S. Utility 'C' Cons.	68—73	...
918,657	,,	4	4	4 p.c. Cons. Pref.	72—77	...
675,000	May 6	†4	†4	Montevideo, Ltd.	52—57	...
300,000	Apl. 29	9	7	Oriental, Ltd.	100—110	...
368,537	June 3	7	8	Plymouth & Stonehouse 5 p.c.	90—100	...
621,667	Aug. 19	8½	7¼	Portsmouth & Gosport Cons.	97—102	...
648,999	Sept. 16	1/1		Severn Val. Gas Cor. Ld. Ord.	13/6—15/6	...
597,972	,,	-/10½		Do. 4½ p.c. Cum. Pref. ...	15/6—17/6	...
2,528,714	Sept. 2	1/-	-/7⅛	South East'n Gas Cn. Ld. Ord.	9/—11/-	−/6
1,000,000	,,	-/10½	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
1,068,869	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	13/—15/-	...
6,709,895	Aug. 5	4	4	South Met. Ord.	53—58	...
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	98—108	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	70—75	...
1,895,445	July 1	3	3	Do. 3 p.c. Perp. Deb. ...	60—65	...
1,000,000	July 15	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...
1,543,795	July 22	3	4	South Suburban Ord. 5 p.c. ...	60—70	...
512,825	July 8	5	5	Do. 5 p.c. Perp. Pref. ...	88—93	...
500,000	,,	4	4	Do. 4 p.c. Perp. Pref. ...	71—76	...
250,000	,,	3¾	3¾	Do. 3¾ p.c. Red. Pref. ...	80—85	...
888,587	June 10	5	5	Do. 5 p.c. Perp. Deb. ...	90—95	...
750,541	Aug 9	5½	5½	Southampton Ord.	62—67	...
350,000	Feb. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	90—95	...
1,076,495	Aug. 5	5	5	Tottenham & District Ord. ...	68—78	...
338,555	,,	5	5	Do. 5 p.c. Pref.	93—98	...
453,380	June 10	4	4	Do. 4 p.c. Perp. Deb. ...	78—83	...
1,247,505	May 20	4	6	U. Kingdom Gas Cor. Ord. ...	12/—14/-	...
1,085,952	May 13	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	13/6—15/6	...
772,709	,,	4	4	Do. 4 p.c. 1st Red. Cum.Pref.	13/—15/-	...
745,263	June 17	4½	4½	Do. 4½ p.c. 2nd Non.Cum. Pf.	12/6—14/6	...
1,200,000	Sept. 9	3½	3½	Do. 3½ p.c. Red. Deb. ...	82—87	...
380,606	Aug. 5	7	6½	Uxbridge, &c., 5 p.c.	80—90	...
1,371,138	July 8	3½	4	Wandsworth Consolidated ...	62—72	...
2,525,768	,,	4	4	Do. 4 p.c. Pref.	60—70	...
1,343,964	June 17	5	5	Do. 5 p.c. Deb.	90—95	...
383,745	,,	4	4	Do. 4 p.c. Deb.	80—85	...
558,342	July 15	6	5	Watford & St. Albans Ord. ...	88—93	...
300,000	June 10	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—90	...

SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 27.	Rise or Fall on Week.
351,685	June 17	5	5	Brighton, &c., 5 p.c. Perp. Deb.	90—95	...
28,700	,, 17	5½	5½	Do. 5½ p.c. Red. Deb. 1942 ...	96—101	...
415,250	,, 17	4	4	Bristol Gas Co., 4 p.c. New Deb.	85—90	...
140,205	July 29	7	7	Cambridge, &c., 7 p.c. Cons. 'B'	100—110	...
295,932	Aug. 19	5	5	Cheltenham, 5 p.c. Cons. Ord....	88—93	...
42,500	July 1	4	4	Do. 4 p.c. Perp. Deb....	82—87	...
150,000	Aug. 12	4	4	Croydon Gas, 4 p.c. Pref. (Irr.)	70—75	...
130,000	July 1	4	4	Do. 4 p.c. Deb. ...	75—80	...
146,700	Aug. 19	5½	5½	East Surrey, 5½ p.c. Pref. 'A' ...	95—100	−2½
53,220	,, 19	6	6	Do. 6 p.c. Cum. Pref. ...	100—110	...
117,425	Feb. 5	8	8	East Wight, 5 p.c. Cons. Ord. ...	100—110	...
...	Aug. 19	6	4	Eastbourne, 'B' 3½ p.c.... ...	65—75	...
239,135	July 8	5	5	Gas Consolidation 'A' Ord. (£1)	13/6—15/6	...
156,600	Aug. 19	5	5	Hampton C't, 5 p.c. Cons. Ord.	68—73	...
18,000	June 10	7	7	Malta & Med'n., 7 p.c. 1st Pref.	60—65	...
10,845	,, 10	7½	7½	Do. 7½ p.c. 2nd Pref.	60—65	...
50,000	Aug. 19	£5 19 6	£5 4 6	Mid. South. Util., 'A' Cons. 5 p.c.	63—73	...
65,000	Aug. 12	5	5	North Middlesex, 5 p.c. Pref. ...	85—90	...
70,000	Sept. 9	5	5	Plymouth & Stone., 5 p.c. Deb.	87—92	...
76,501	July 1	4	4	Reading, 4 p.c. Perp. Deb. ...	75—80	...
74,777	April 1	4	4	Romford, 4 p.c. Debs. (Reg.) ...	85—90	...
21,000	June 10	5	5	Slough, 5 p.c. Perp. Deb. ...	90—95	...
211,740	,, 17	5	5	Southampton, 5 p.c. Red. Deb.	96—101	...
363,575	July 1	5	5	Tottenham, 5 p.c. Reg. Red. Mt.	95—100	...
202,019	Mch. 18	7½	6⅝	Tunbridge Wells, 4 p.c. Scale ...	70—80	...
135,257	June 10	5	5	Uxbridge &c., 5 p.c. Perp. Deb.	90—95	...

PROVINCIAL EXCHANGES

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Sept. 27.	Rise or Fall on Week.
147,756	July 26	6	5	Bath Cons.	98—103	...
22,577	July 22	7	6	Blyth 5 p.c. Ord.	100—105	−7½
1,667,250	July 15	5	5	Bristol, 5 p.c. max.	86—89	...
120,420	June 17	4	4	Do. 1st 4 p.c. Deb.	94—96	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	92—95	...
328,790	,,	5	5	Do. 5 p.c. Deb.	108—111	...
157,150	Aug. 5	6½	5	Chester 5 p.c. Ord.	98—101	...
92,500	June 17	4	4	Do. 4 p.c. Pref.	80—85	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	80—85	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	94—98	...
542,270	Feb. 12	6	9	Derby Cons.	103—108	...
55,000	June 10	4	4	Do. 4 p.c. Deb.	96—102	...
10,000	Aug. 19	10	10	Great Grimsby 'A' Ord. ...	170—180	...
6,500	,,	10	10	Do. 'B' Ord. ...	170—180	...
79,000	,,	10	10	Do. 'C' Ord. ...	160—170	...
732,000	Aug. 26	4	4	Hartlepool G. & W. Cn. & New	63—68	...
2,167,410	Aug. 19	6	6	Liverpool 5 p.c. Ord.	96—98	...
245,500	June 17	5	5	Do. 5 p.c. Red. Pref. ...	97½—100½	...
306,083	July 15	4	4	Do. 4 p.c. Deb.	99—101	...
20,000	June 24	5	5	Long Eaton 5 p.c. Pref.	9—11	...
80,000	June 24	5	5	Do. 5 p.c. Deb.	100—105	...
2,430,267	July 29	5 7/10	5	Newcastle and Gateshead Con.	16/—17/-a	+/6
682,856	,,	4	4	Do. 4 p.c. Pref.	74—76	+1
776,706	Dec. 27	3½	3½	Do. 3½ p.c. Deb.	80—85	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	97—102	...
274,000	July 26	5	5	Newport (Mon.) Ord.	89—93	...
13,200	Sept. 16	8⅔	7	Pontyp'l Gas & W. 10 p.c. 'A'	11¼—12½	...
13,600	,,	6	5	Do. 7 p.c. 'B'	9½—10½	...
40,000	,,	5	6	Do. 7 p.c. 'C'	9½—10½	...
106,280	Aug. 5	8	10	Preston 'A' 10 p.c.	157—167	...
188,219	,,	7	7	Do. 'B' 7 p.c.	113—123	...
1,806,339	Aug. 26	6½	6½	Sheffield Cons.	117½—120½	...
95,000	July 8	4	4	Do. 4 p.c. Deb.	97— 99	...
332,351	Feb. 5	6	6	Sunderland 6 p.c. max. ...	107—112	...
140,778	Aug. 12	5	5	Weston-super-Mare Cons. ...	80—85	−6½
64,338	June 24	4	4	Do. 4 p.c. Deb.	75—85	−12½
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	137—145	...

a.—The quotation is per £1 of Stock. * Ex. div. † Price free of income-tax.

loss of pressure lowers the bell *d*, and, raising the glass cylinder *g* from the mercury, allows water to discharge, so reducing the counter-balance on the retort house governor.

Conversely, loss of vacuum or gain in pressure in the foul main raises the bell *d* and, closing the mercury valve, prevents discharge of water.

Water is supplied to this apparatus by the apparatus illustrated in Fig. 2, which is fixed near the retort house governor and operates in the opposite manner to the apparatus of Fig. 1.

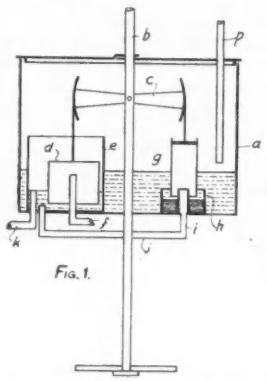

Fig. 1.

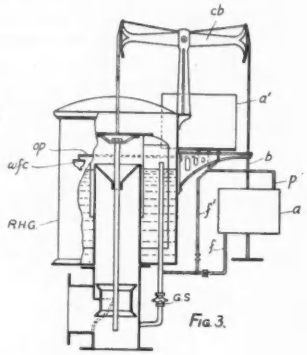

Fig. 3.

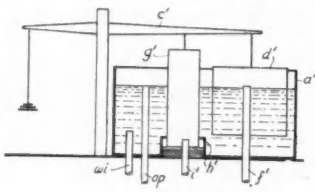

Fig. 2.

This second apparatus consists of an outer cylindrical water container a^1 supported on a fixed part of the retort house governor R.H.G. at a level higher than that of the tank *a* of the first apparatus, illustrated in Fig. 1. Floating in the water in the container a^1 is a bell d^1 suspended from one end of a counter-balanced arm c^1, the gas supply f^1 to the bell d^1 being taken from the gas supply from the foul main to the bell of the retort house governor. Suspended from the beam on the same side as the bell d^1 is a glass cylinder g^1 which dips into a mercury cup h^1 provided with a central outlet i^1 which is connected to a pipe *p* projecting into the tank *a* of the apparatus of Fig. 1 for replenishing the water therein. An inlet pipe *wi* supplies water to the tank a^1, while an overflow pipe *op* is provided leading to the water feed cup *wfc* of the retort house governor.

Any excess pressure in the foul main, due to an additional output from the retorts, lifts the bell d^1 (and also the bell *d* of Fig. 1), thus raising the cylinder g^1 to allow water to flow into the outlet i^1 and thence through pipe *p* into the tank *a* of the gas compensating apparatus of Fig. 1 and thereby increase the weight on the counter-balance *cb* of the retort house governor.

Conversely any lowering of pressure in the foul main lowers the bell d^1 and the cylinder g^1 until the latter dips into the mercury cup h^1 to cut off the water supply to outlet i^1.

The cylinders *g* and g^1 may be replaced by a cone valve if desired.

In a modified form of construction the gas supply pipes *f* and f^1 are connected to the gas supply from the foul main to the bell of the retort house governor below the gas supply valve G.S. and not above the said valve as illustrated.

Australian Gas Light Company

The Directors of the Australian Gas Light Company, in a notice to proprietors, regret that the net profits for the half-year ended June 30, 1940, only permit of the payment of an interim dividend at the rate of 2% on the "A" and "B" shares, which rate is equal to 4% per annum.

In August last year the Company exercised its right under the Gas and Electricity Act, 1935, by making application for an increase in the standard price of gas. This application was investigated by a Board of Enquiry which found that the proposals for an increase submitted by the Company were justified and recommended them for adoption, but Cabinet, which has the final determination, advised the Company of its decision that the recommendation should not be adopted.

The Directors and the Management of the Company have continued their close investigation into every phase of the Company's operations with the object of reducing costs, wherever possible, compatible with general efficiency and the maintenance of good service to customers, with the result that economies have been effected. These, however, have not been sufficient to counterbalance the increasing costs beyond the control of the Company.

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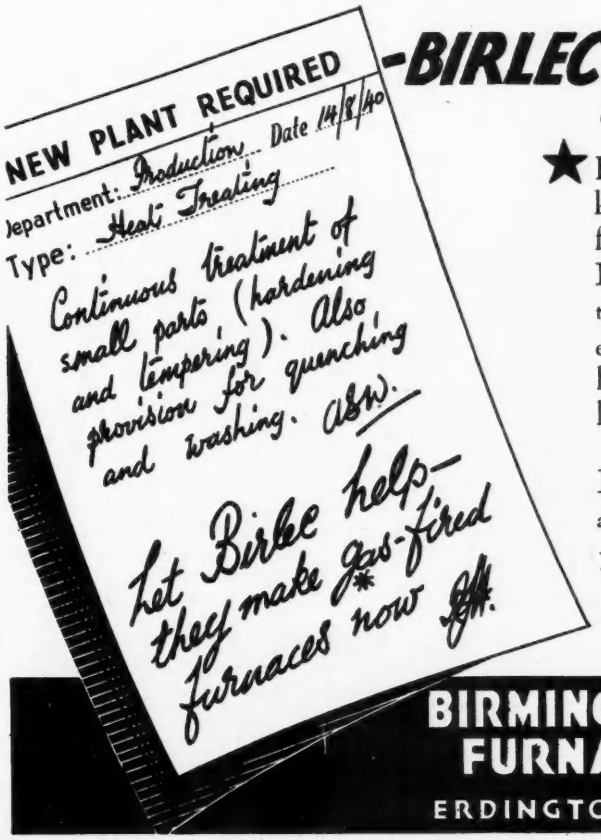
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